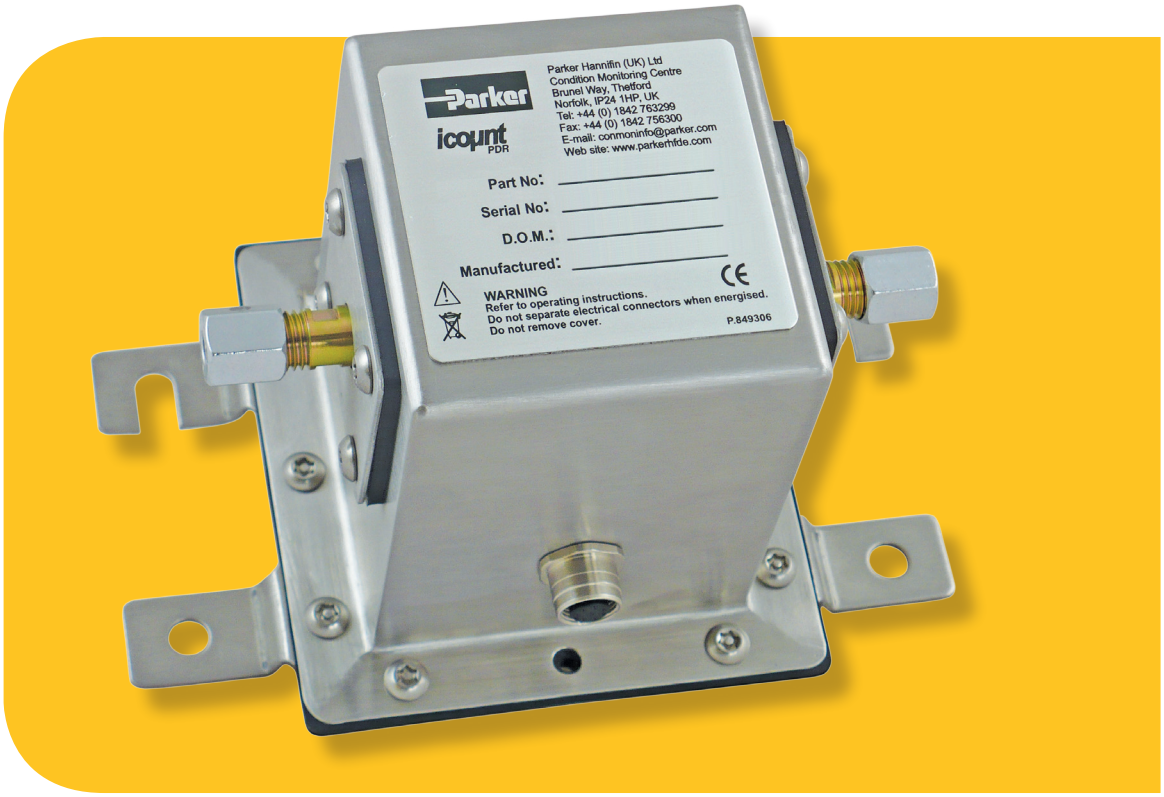
icountPDR



GB

icountPDR User Manual

Parker

DD0000002_IPDR_GB_Ver A

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www.parkerhfde.com

Overview

Parker Hannifin's icountPDR is an on-line laser particle detector. This mineral based hydraulic fluid contamination detector is designed for use in robust areas and is housed in a stainless steel IP69K approved enclosure.

The unit has two size 06L EO 24° cone-end hydraulic connections that allow the fluid to be transferred through the unit for analysis. The electrical supply and communication is made via an M12 Ultra Lock IP69K approved connector.

Conditions for safe use

To ensure compliance with the certification, users are NOT permitted to open the unit under any circumstances. Doing so will invalidate the unit's calibration and it would NOT be suitable for calibrated use.

Laser Information

This product contains an invisible infrared 5mW laser.

Any dismantling of the product may result in dangerous exposure to laser radiation.

The following laser information is on a label on the top surface of the product:

CAUTION: Users are not required to access the laser radiation source and should never do so.

The internal laser warning label is mounted on the laser module and contains the following information:

LASER RADIATION

AVOID EXPOSURE TO BEAM

CLASS 3R LASER PRODUCT

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EC Declaration of Conformity

EC Declaration of Conformity

Document No. Doc 0013- Issue 1

Parker Hannifin (UK) Ltd
Hydraulic Filter Division Europe
Condition Monitoring Centre
Brunel Way
Thetford
Norfolk
IP24 1HP
United Kingdom

Product(s):

The following icountPDR products have been approved:

- *icountPDR compatible with mineral oils and aviation fuels*
- *icountPDR calibrated with MTD or ACFTD*
- *icountPDR without a limit relay*
- *icountPDR with RS232, 4-20mA, CanBus and 0-3/0-5V outputs*
- *icountPDR with or without a Mositure Sensor*
- *icountPDR supplied with a 5m M12 Ultralock Cable harness and bolt kit*

The Product(s) described above are in conformity with the essential requirements of the following directives:

89/336/EEC amended by 92/31/EEC, 93/68/EEC and repealed by 2004/108/EEC

Harmonised standards:

EN61000-6-3:2007 *Electromagnetic compatibility –*
Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments.

EN61000-6-2:2005 *Electromagnetic compatibility (EMC) –*
Part 6-2: Generic standards – Immunity for industrial environments

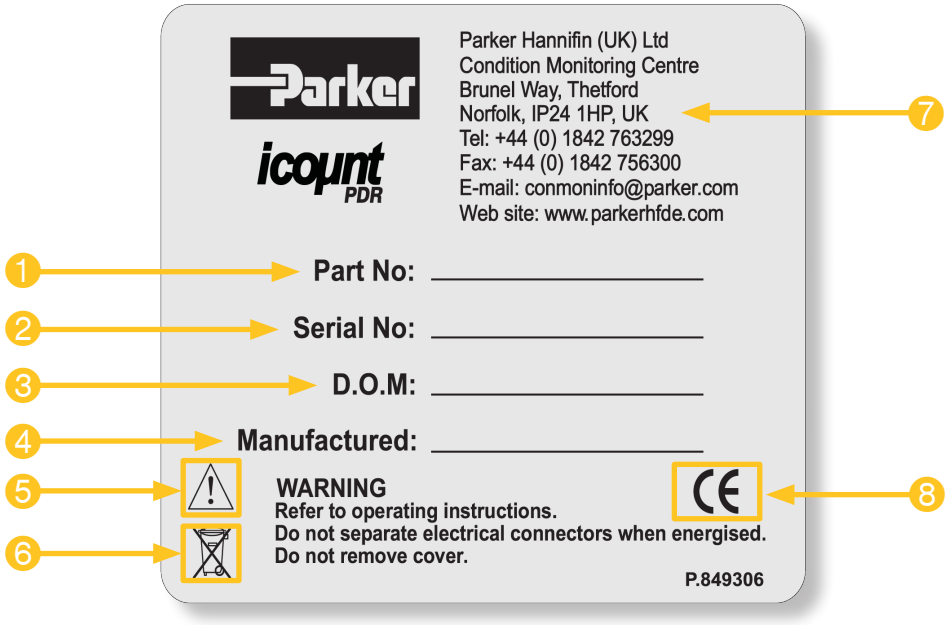
Signed for and on behalf of Parker Hannifin (UK) Ltd, Thetford

Mark Hayman
Engineering Manager

CMC E12 Issue 1, May 07

Product identification label

The identification label attached to the enclosure (an example is given below) is explained in the table that follows:



Item	Field	Values
1	Part Number	icountPDR
2	Serial Number	The serial number consists of eight digits, for example: **GD6NN001** ('**GD**' is the month and year; '**6NN**' is the product group; the last three digits are entered sequentially through a month, reverting to '**001**' at the beginning of each month)
3	D.O.M.	Date of manufacture
4	Manufactured	Country of manufacture (United Kingdom)
5	Exclamation mark icon	Refer to product manual 'Safety Recommendations'
6	WEEE Disposal icon	At the end of life dispose of responsibly, do NOT dispose of in general waste
7	Name and address of manufacturer	Parker Hannifin (UK) Ltd, Filter Division Europe, Condition Monitoring Centre, Brunel Way, Thetford, Norfolk, IP24 1HP, UK
8	CE Conformity marking and number of notified body responsible for audit production	**CE 0518**

Introduction

Parker Hannifin's icountPDR represents the most up-to-date technology in solid particle contamination analysis. The icountPDR is a compact, permanently-mounted laser-based particle detector module that provides a cost-effective solution to fluid management and contamination control.

Principles of operation

The icountPDR measures particle contamination continuously and updates the output options and limit relay every second.

Unlike the Parker CM20, LCM20 or MCM20, the unit does not perform a 'one-off' test. This means that even if the Measurement Period is set to 60 seconds, the output and limit relay all report the presence of dirt in the oil in just a few seconds – it does not wait until the end of the Measurement Period before reporting the result.

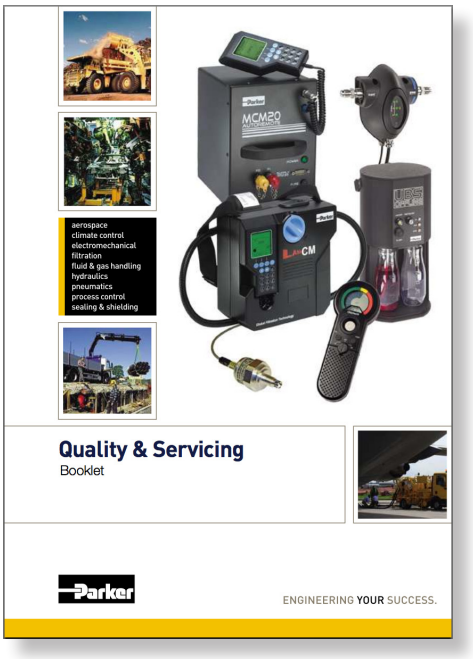
The icountPDR has just one setting to control the accuracy, stability and sensitivity of the measurements and that is the 'Measurement Period'. This can be set from 5 seconds to 180 seconds. The longer the Measurement Period, the more contaminant is measured, averaging out any spikes seen on a smaller sample. The shorter the Measurement Period, the more sensitive the icountPDR is to small slugs of contaminant, but it can also reduce the performance on clean systems. Thus, the user can select how sensitive the icountPDR is to spikes of contaminant, and how quickly it responds to contamination levels above the set point ('limits').

With a Measurement Period of 100 seconds, the results will be for the last 100ml of oil that has flowed through the icountPDR, updated on a second-by-second basis, giving an effectively continuous readout of the level of contamination.

Calibration recommendations

NOTE: Any servicing or repair work must be carried out by a Parker approved service centre. Contact your local Parker Hannifin Sales Company for recalibration details. The recommended period between recalibration is 12 months.

Please refer to the Parker Hannifin Quality and Servicing booklet (FDCB272UK), supplied on CD.



Benefits

- Independent monitoring of system contamination trends
- Calibration by recognised online principles confirmed by relevant International Organization for Standardization (ISO) procedures
- Indicators for Low, Medium and High contamination levels
- A low cost solution to prolonging fluid life and reducing machine downtime
- Self-diagnostic software
- Mineral fluid-compatible construction
- Fully PC/PLC integration technology such as: RS232, 0–3V/0–5V, 4–20mA and CAN-bus (SAE J1939) – see the ‘Product Configurator’, page 45, for communication options
- Percentage saturation reporting through an integrated moisture sensor – see the ‘Product Configurator’ on page 45, for the moisture sensor option.

Technical specification

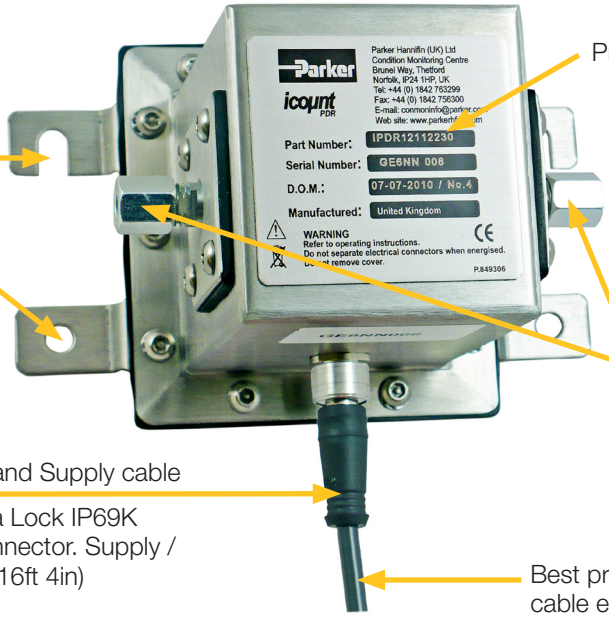
Feature	Specification
Product start-up time	5 seconds minimum
Measurement period	5–180 seconds
Reporting interval	0–3600 seconds via RS232 communication
Principle of operation	Laser Diode optical detection of actual particulates
International codes	ISO 7 – 22, NAS 0 – 12
Calibration	By recognised online methods confirmed by the relevant ISO procedures: **MTD** – via a certified primary ISO 11171 automatic particle detector using ISO 11943 principles, with particle distribution reporting to ISO 4406:1996
Recalibration	Contact Parker Hannifin
Working pressure	2–420 bar (30–6000 PSI)
Flow range through icountPDR	**Note**: Flow may be bi-directional 40–140 ml/min (optimum flow 60 ml/min) (0.01 – 0.04 USGPM (optimum flow 0.016 USGPM))
Online flow range via System 20 sensors	Size 0 = 6 to 25 l/min (2–7 USGPM) Size 1 = 24 to 100 l/min (6–26 USGPM) Size 2 = 170 to 380 l/min (45–100 USGPM)
Ambient storage temperature	–40°C to +80°C (–40°F to +176°F)
Environment operating temperature	-30°C to +60°C (–22°F to 140°F)
Fluid operating temperature	+5°C to +80°C (+41°F to 176°F)
Computer compatibility	Parker recommends the use of a 9-way D-type connector. This can be connected to a USB port using a USB-serial adaptor. Note that these connectors/adaptors are **NOT** supplied with icountPDR units: contact Parker Hannifin for advice.
Moisture sensor calibration	±5% RH (over compensated temperature range of +10ºC to +80ºC; +50ºF to +176ºF)
Operating humidity range	5% RH to 100% RH
Moisture sensor stability	±0.2% RH typical at 50% RH in one year
Power requirement	Regulated 9–40Vdc
Current rating	Typically 120mA
Certification	IP69K rating EC Declaration of Conformity (see page 4).
Analogue output options (specified when ordering)	
Variable current	4–20mA
Variable voltage	0–5Vdc, 0–3Vdc (user selectable)
CAN-bus	to SAE J1939 (e.g. *Parker IQAN*)
Moisture sensor	Linear scale within the range 5% RH to 100% RH

Software default settings

Standard defaults	
Comms echo	OFF
Verbose errors	OFF
STI Sensors used	OFF
Reporting standards	ISO
Particle limits	19 / 18 / 15
Measurement period	60 seconds
Reporting interval	30 seconds
Power-on mode	AUTO
Auto start delay	5 seconds
Date format	dd/mm/yy

Default if options fitted	
Relay hysteresis	ON
Relay operation for particle limits	ON
Relay operation for moisture sensor limits	ON
0–5V/0–3V output voltage range	0–5V
Moisture sensor limit	70%

Product features



Product identification label

Four mounting locations (two each side) to suit M8 (5/16") fixings (supplied)

Size 06L EO 24° cone end hydraulic connections (Pipe not supplied)

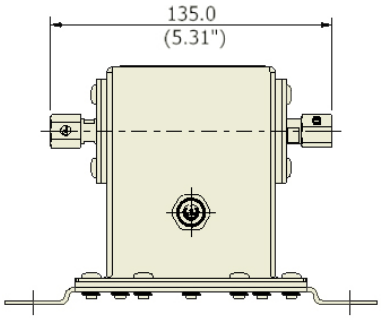
Communication and Supply cable

M12, 12-pin Ultra Lock IP69K Rated female connector. Supply / Limit Cable, 5m (16ft 4in)

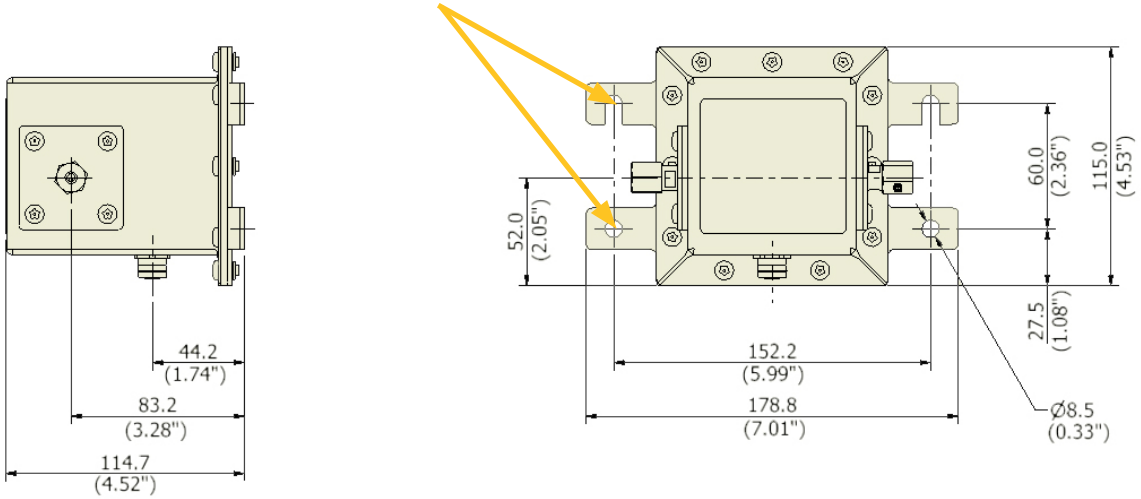
Best practice mouning orientation (i.e. cable exits from the bottom of the unit). Contact Parker Hannifin if you require further advice installing the icountPDR in your system.

Dimensions for installation

Dimensions are given in mm (inches)



Four mounting locations (two each side) to suit M8 (5/16 inch) fixings, supplied. Flange thickness is 2mm (5/64 inch)



Connections

Hydraulic connection

Our recommendation is to position the icountPDR as close to the system output as possible whilst controlling the flow to the optimum 60ml/min. This then provides the highest pressure conditions, plus the oil in this position is indicative of the reservoir's oil condition.

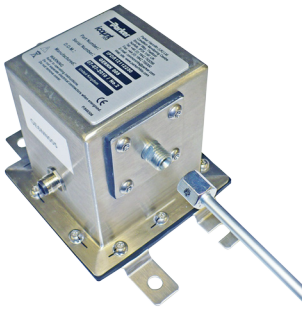
The icountPDR is supplied with two size 06L EO 24° cone-end hydraulic connections.

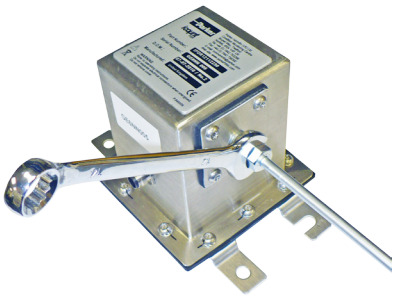
For hydraulic connection, ensure that the hydraulic/pipe connection fitting is compatible with the size 06L EO 24° cone bulkhead fitting.

Assembling the EO nut fitting

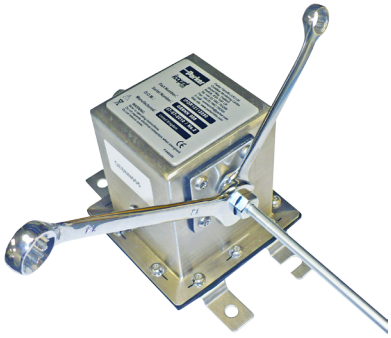
Step 1 Press the tube-end firmly into the assembly core.

Turn back the nut for easy tube insertion and fit the nut hand tight, then tighten the fitting until you feel a sharp increase in resistance.





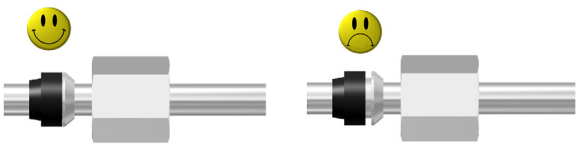
2 Ensure the bulkhead fitting is held with a 10mm spanner and tighten (approximately 1 to 1½ turns).



3 Now remove the pipe and nut to check assembly.

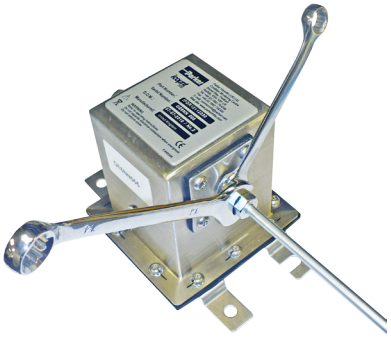
The gap between sealing ring and retaining ring must be closed. A little relaxation (approximately 0.2mm) is allowed.

If the gap is not closed: Check all components, including the tube.



4 Assemble the fitting until wrench-tight (without spanner extension).

Tighten the fitting firmly by a minimum 1/6 (max ¼) turn (i.e. 1 to 1½ flats)



Flow control

LOW TO MEDIUM VISCOSITY FLOW CONTROL OPTION

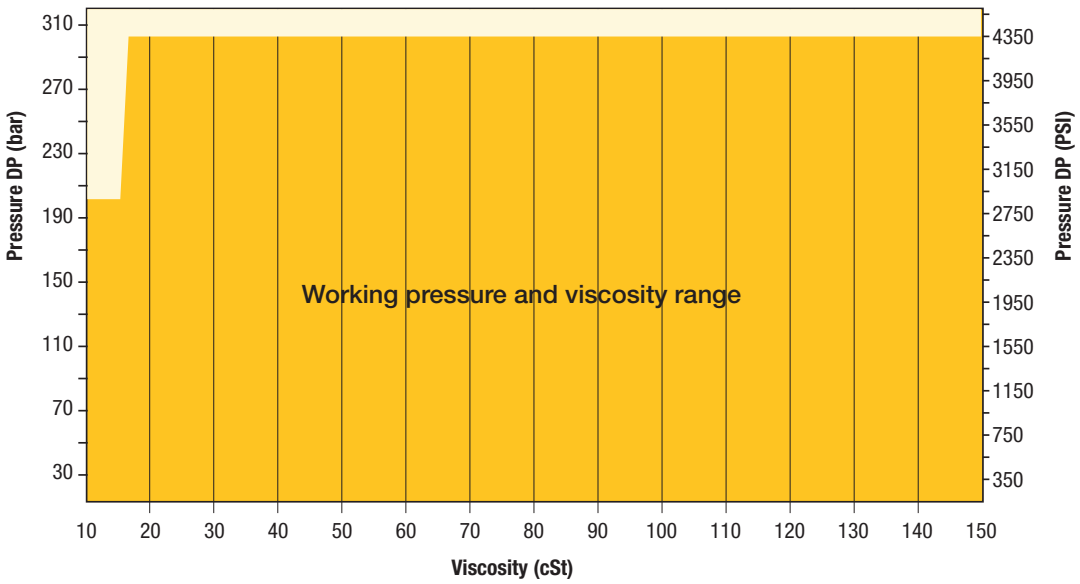
A pressure compensated, flow control device (Parker Hannifin part number ACC6NN022) has been developed to give the icountPDR user greater flexibility. The flow control device enables testing where flow ranges are outside the icountPDR specifications (i.e. 40–140 ml/min), or where pipe diameters do not allow the icountPDR to be installed.

The flow control device fits onto the downstream (outlet) side of the icountPDR. A 06L EO 24deg cone end hydraulic adaptor is supplied which enables connection directly to the icountPDR. Alternatively the flow control device can be fitted further down stream.

The compact design requires no setting up or further user intervention as long as the system conditions remain within the recommended pressure and viscosity ranges as below.

Working pressure range	10 to 300bar
Differential pressure range	10 to 300bar
Working viscosity range	10 to 150 Cst

The working pressure and viscosity range for this device is shown in the shaded area of the following graph:



HIGH VISCOSITY FLOW CONTROL OPTION

The flow control device (S840074) fits onto the downstream (outlet) side of the icountPDR, connecting through a manifold block via a self-sealing quick connection test point.

The differential pressure valve automatically compensates for pressure and viscosity changes, while maintaining its flow setting even as the workload changes.

Working pressure range	10 to 300bar
Differential pressure range	10 to 300bar
Working viscosity range	90 to 500 Cst

The table below is used to select the appropriate valve position:

Valve position	cSt range
3.8	90–200
4.2	190–320
5	310–500

System 20 sensor connection

Online flow range via System 20 inline sensors:

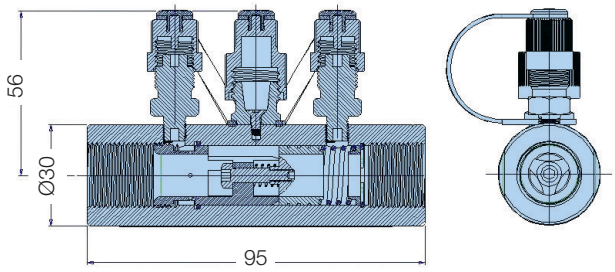
Size 0	6 to 25 l/min (optimum flow = 15 l/min)
Size 1	24 to 100 l/min (optimum flow = 70 l/min)
Size 2	170 to 380 l/min (optimum flow = 250 l/min)

The required differential pressure across inline sensors is 0.4 bar (minimum)

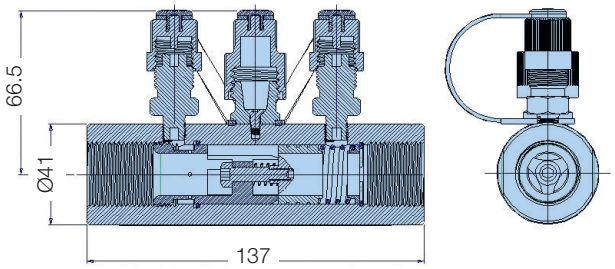
Refer to the 'Sensor part numbers' section on page 45 before ordering System 20 sensors.

See 'Inline Sensor Monitors' (Parker Hannifin Brochure CM013GB1) for more information on System 20 sensors.

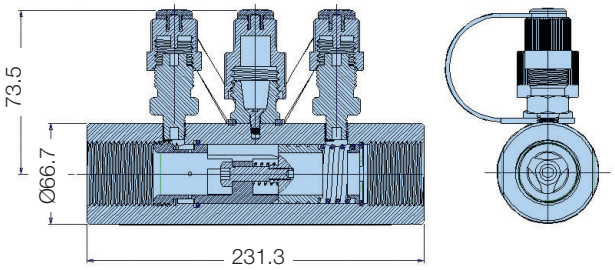
Size 0 Sensor



Size 1 Sensor



Size 2 Sensor



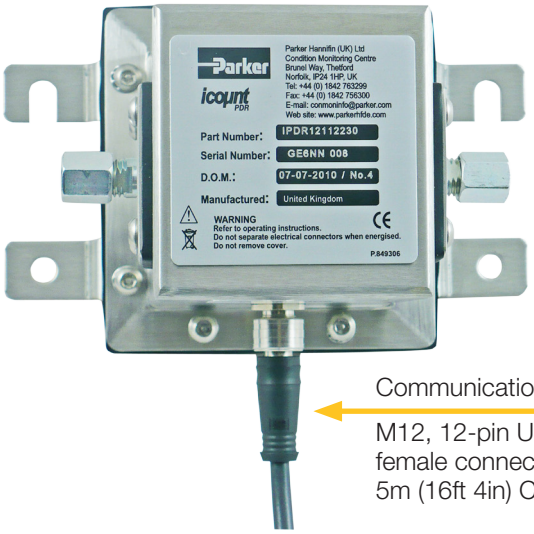
(All dimensions are in millimetres)

IMPORTANT NOTE: P1 and P2 of the System 20 sensors MUST be connected to the icountPDR test points. Ensure that the icountPDR command 'SSU' is set to 'Yes' when connecting to icountPDR – refer to 'Communication protocol' section of this manual for a list of user commands.

Contact Parker Hannifin if you require further advice in connecting icountPDR to your system.

Electrical connections

The M12 12-pin Ultra Lock connection system uses innovative push-to-lock technology to make a quick but secure connection. The unique O-ring radial seal is operator-independent, so there is no chance of over-tightening or under-tightening.

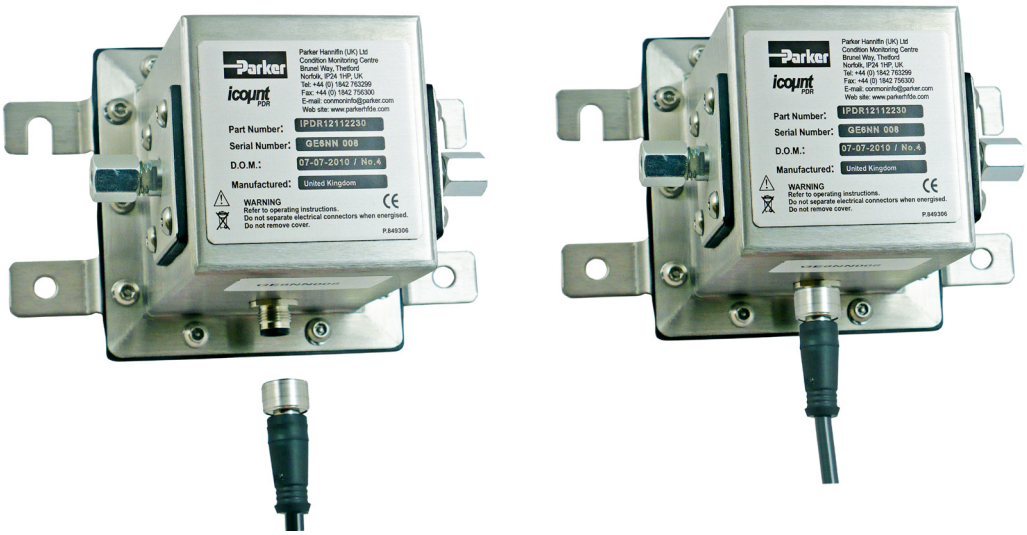


Communication and Supply cable

M12, 12-pin Ultra Lock IP69K-rated female connector to unterminated 5m (16ft 4in) Communication cable.

IMPORTANT NOTE: The IP69K Ingress Protection is only valid when using the M12 Ultra Lock mating connector cable (supplied).

CONNECTING/DISCONNECTING



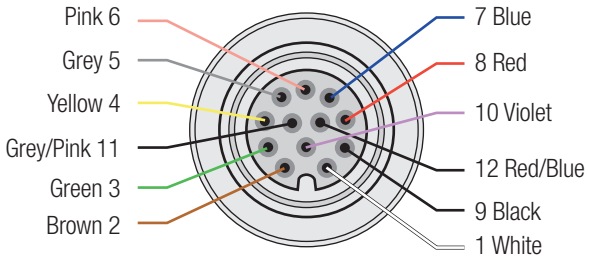
Ensure that the locating pin and slot are correctly aligned (to avoid damaging the pins) and push home firmly to connect. To disconnect, pull the Ultra Lock's metal collar back to release the cable lock and pull the cable boot out squarely.

WIRING DIAGRAMS

Wiring diagrams are provided (on pages 17–18), showing how a digital multimeter may be connected to the Communication and Supply cable, for both voltage and current options. The connections for an optional moisture sensor (if fitted) are also shown.

A diagram for connecting the icountPDR to an external CAN-bus network is given on page 19.

Communication and Supply cable connector



Pin configuration diagram
M12, 12-pin Ultra Lock IP96K female connector, end view

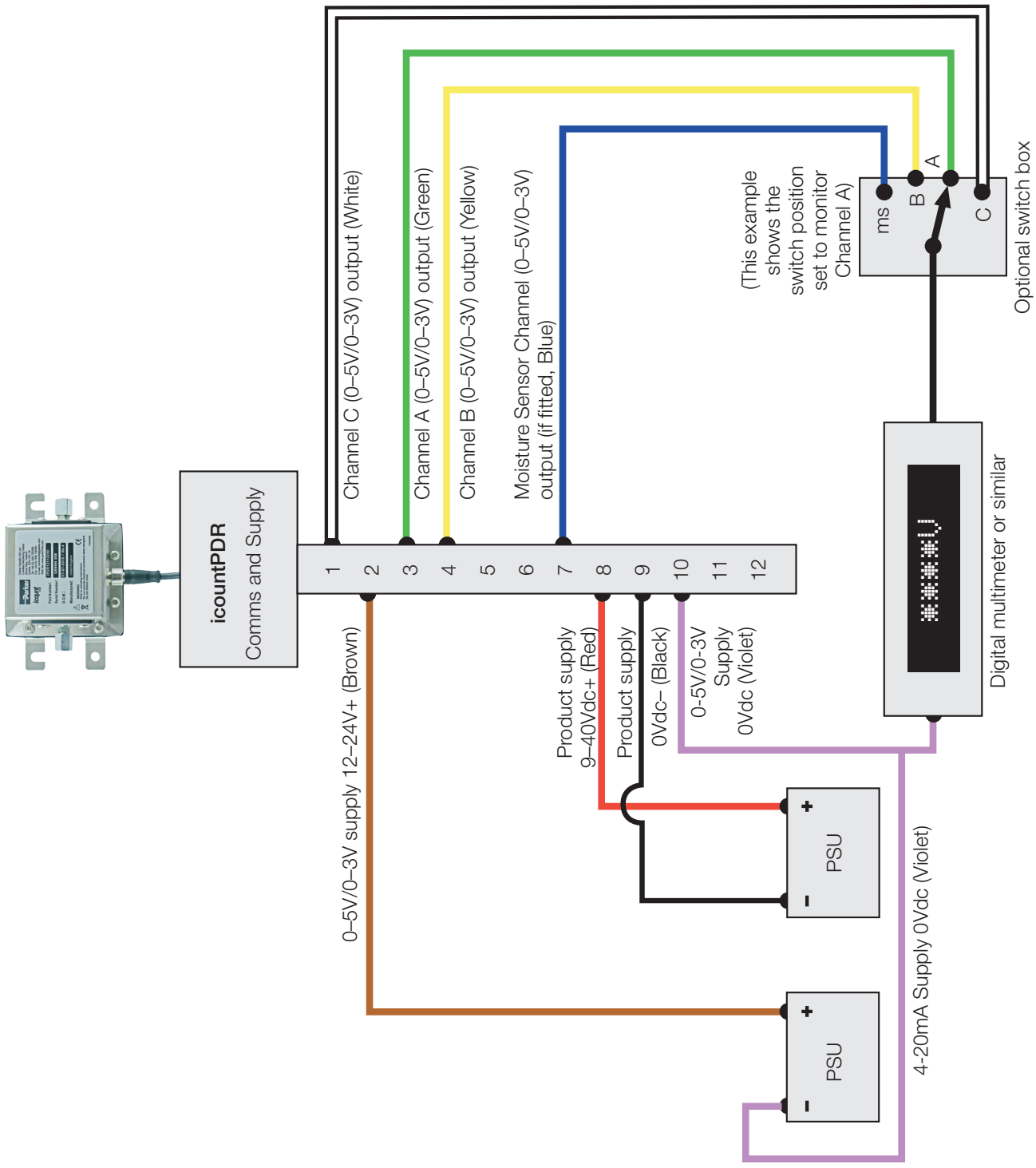
Pin number (wire colour recommended)	No options fitted	0–5V/0–3V option fitted	4–20mA option fitted	CAN-bus option fitted
1 (White)	NOT USED	Channel C, ISO 14µm(c.)	Channel C, ISO 14µm(c.)	CAN High
2 (Brown)	NOT USED	0–5/0–3V Supply 12–24Vdc	4–20mA Supply 12–20Vdc	NOT USED
3 (Green)	NOT USED	Channel A, ISO 4µm(c.)	Channel A, ISO 4µm(c.)	CAN Low
4 (Yellow)	NOT USED	Channel B, ISO 6µm(c.) *or* NAS (if selected)	Channel B, ISO 6µm(c.) *or* NAS (if selected)	NOT USED
5 (Grey)	RS232 Receive (* Pin 3)	RS232 Receive (* Pin 3)	RS232 Receive (* Pin 3)	RS232 Receive (* Pin 3)
6 (Pink)	RS232 Transmit (* Pin 2)	RS232 Transmit (* Pin 2)	RS232 Transmit (* Pin 2)	RS232 Transmit (* Pin 2)
7 (Blue)	NOT USED	With or without Moisture Sensor	With or without Moisture Sensor	CAN Ground
8 (Red)	Product Supply 9-40Vdc	Product Supply 9-40Vdc	Product Supply 9-40Vdc	Product Supply 9-40Vdc
9 (Black)	Product Supply 0Vdc	Product Supply 0Vdc	Product Supply 0Vdc	Product Supply 0Vdc
10 (Violet)	NOT USED	0–5/0–3V Supply 0Vdc	NOT USED	NOT USED
11 (Grey / Pink)	RS232 Ground (* Pin 5)	RS232 Ground (* Pin 5)	RS232 Ground (* Pin 5)	RS232 Ground (* Pin 5)
12 (Red / Blue)	NOT USED	NOT USED	NOT USED	NOT USED

** Parker Hannifin recommends the use of a 9-way D-type socket with RS232, using the pin configurations given in the above table.*

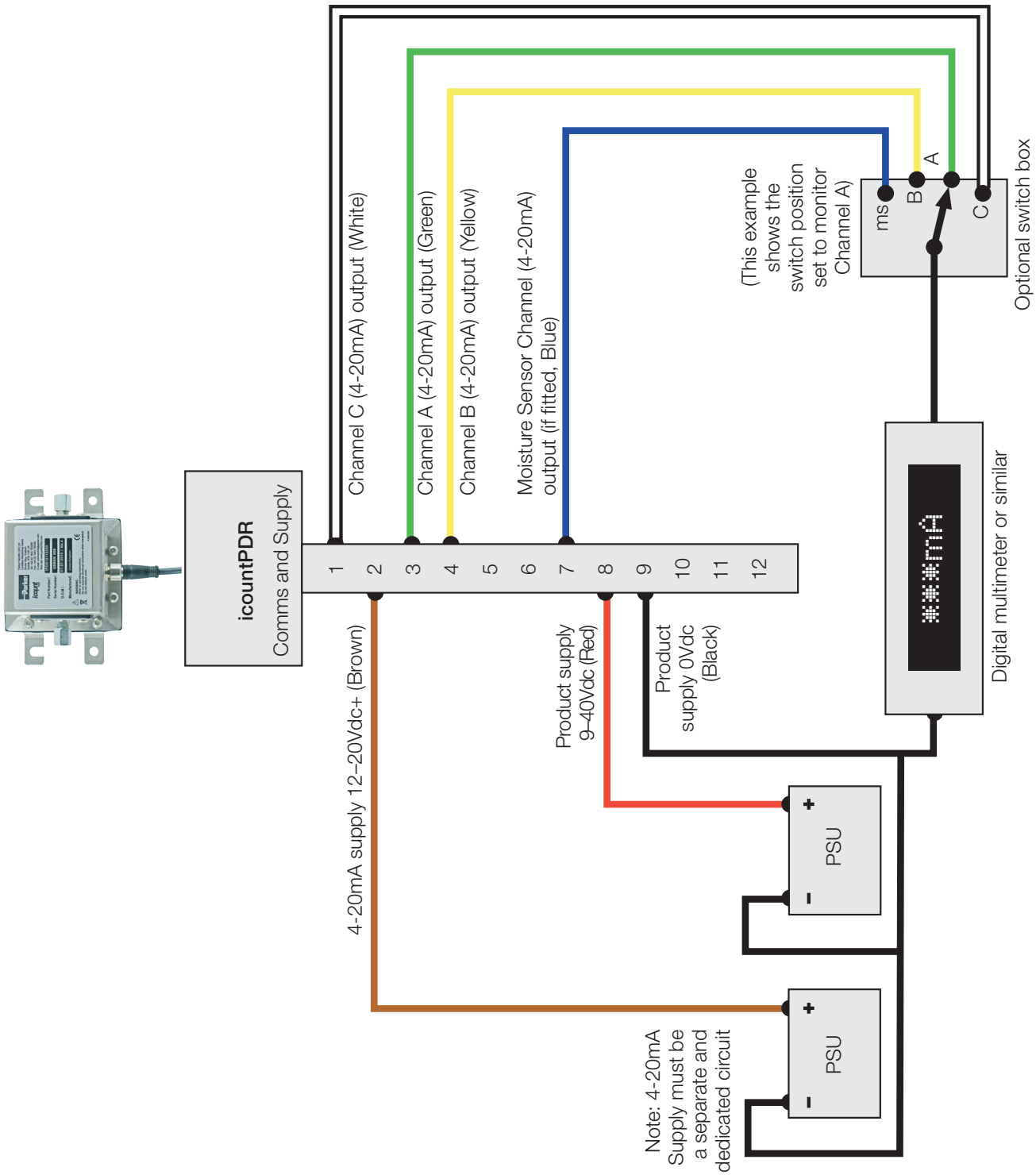
NOTE: If the moisture sensor is fitted without the 4–20mA or the 0–5V/0–3V option, then the output is via RS232.

IMPORTANT NOTE: It is the responsibility of the end user to ensure that the cable's braided screen is terminated to a suitable earth bonding point.

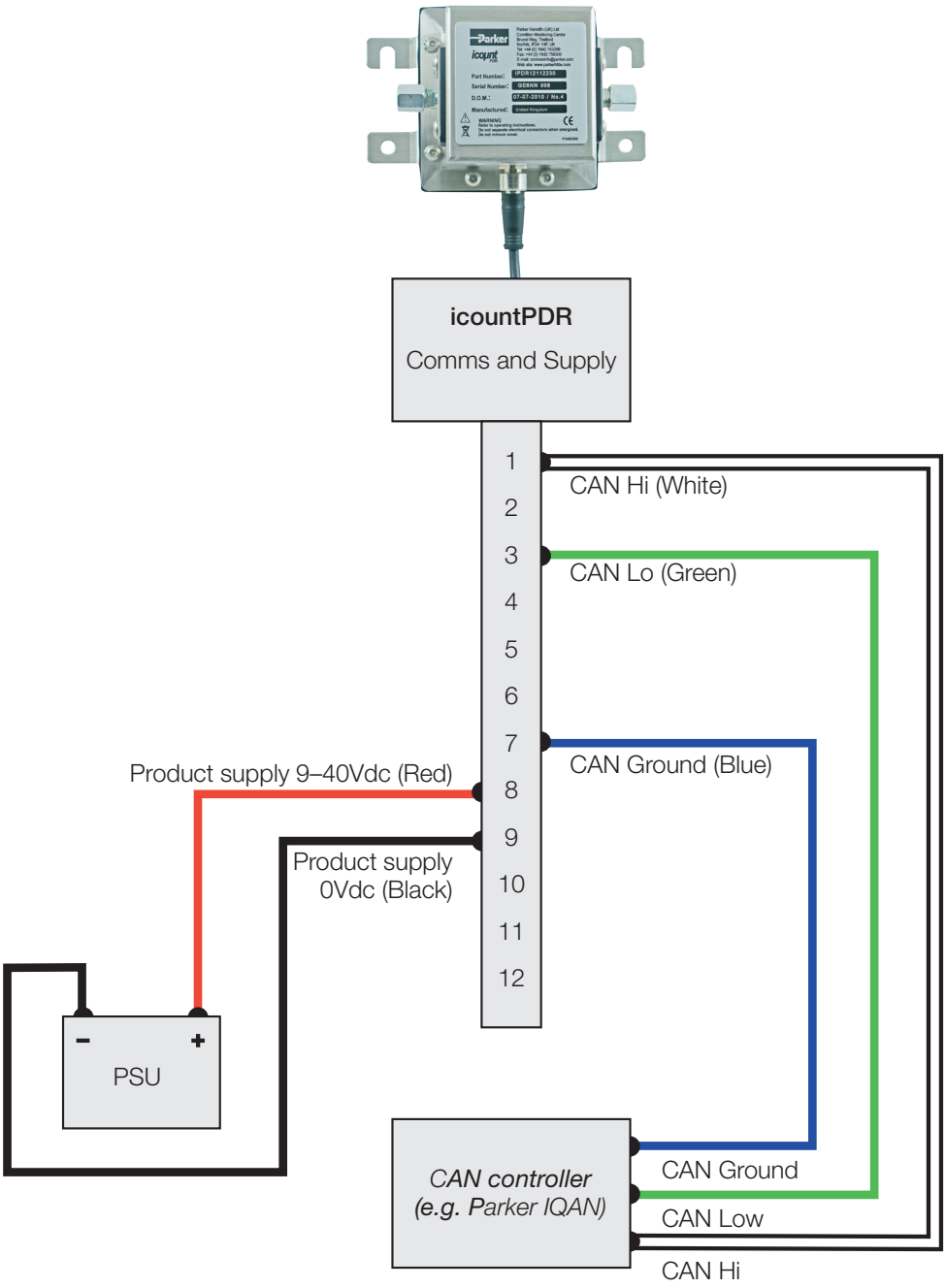
M12, 12-pin connector: 0–5V/0–3V voltage measurement



M12, 12-pin connector: 4–20mA current measurement



CAN-bus (SAE J1939) connections



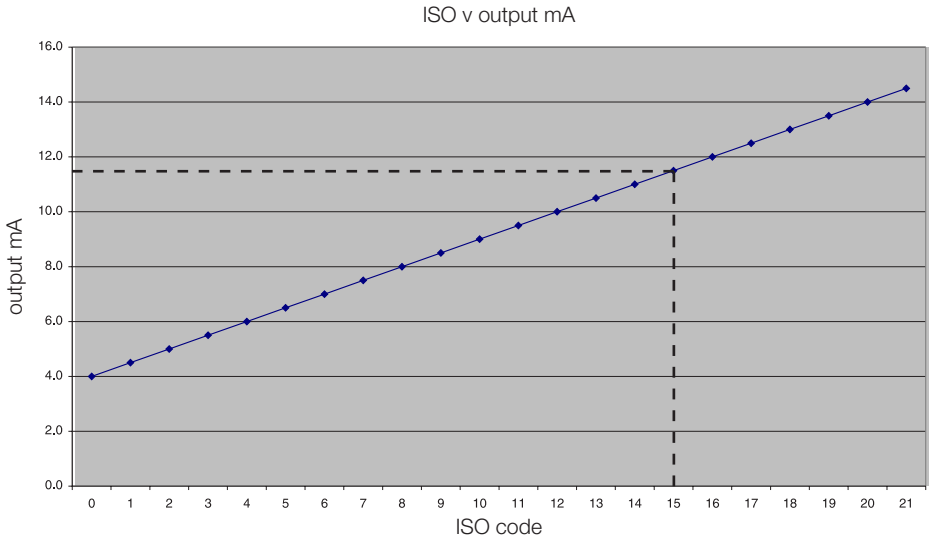
Variable current output settings

ISO setting

The following table can be used to relate an analogue output (in mA) to an ISO code. For example, an output of 10mA is equal to an ISO code 12.

mA	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0
ISO	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

cont. **mA**	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	17.5	18.0	18.5	19.0	19.5	20
ISO	17	18	19	20	21	22	*	*	*	*	*	*	*	Over-range		ERROR



The actual calculation is as follows:
ISO code = (output in mA – 4) x 2

e.g. (11.5mA – 4) x 2 =
7.5 x 2 = ISO 15

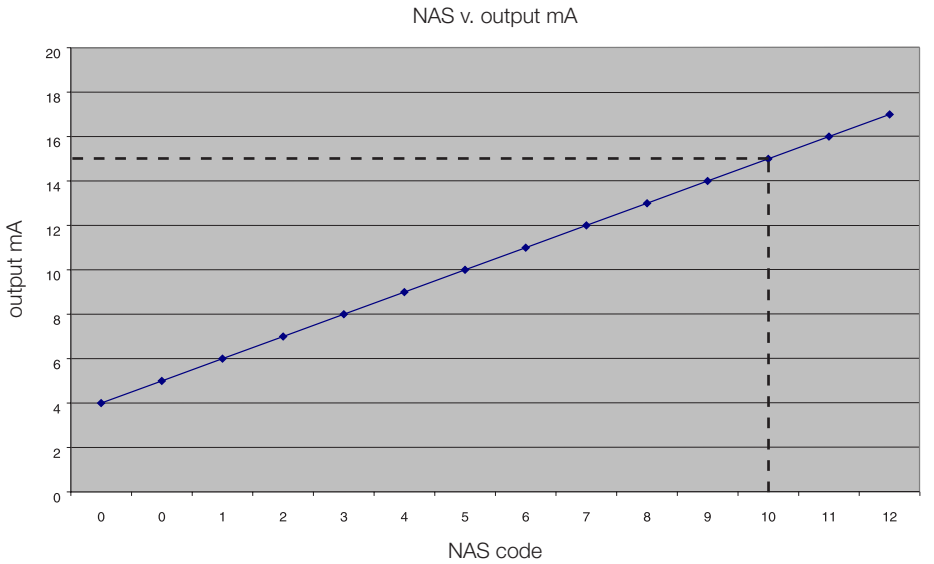
* = Saturation (i.e. above ISO code 22)

NAS setting

The following table can be used to relate an analogue output (in mA) to a NAS code. For example, an output of 15mA is equal to NAS code 10.

mA	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NAS	00	0	1	2	3	4	5	6	7	8	9	10	11	12	*	*	ERROR

Note: * = Saturation (above NAS code 12)



The actual calculation is as follows:
NAS code = (output in mA – 5)

e.g. 15mA – 5 = NAS 10

* = Saturation (i.e. above NAS code 12)

Variable voltage output settings

The variable voltage output option is capable of two different voltage ranges: a 0–5Vdc range as standard, and a user-selectable 0–3Vdc range. The 'Full list of commands' section of this manual (page 31–33) gives information on how to change the voltage output range.

The following tables can be used to relate the analogue output to an ISO or NAS code.

For example, in a 0–5Vdc range, ISO code 16 is equal to an output of 3.5Vdc. In a 0–3Vdc range, ISO code 8 is equal to an output of 1.0Vdc.

Table relating ISO codes to Voltage output

ISO	Err	0	1	2	3	4	5	6	7	8	9	10	11
0–5Vdc	<0.2	0.3	0.5	0.7	0.9	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.5
0–3Vdc	<0.15	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3

cont. ISO	12	13	14	15	16	17	18	19	20	21	22	Err
0–5Vdc	2.7	2.9	3.1	3.3	3.5	3.7	3.9	4.1	4.3	4.5	4.7	>4.8
0–3Vdc	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	>2.45

Table relating NAS codes to Voltage output

NAS	Err	00	0	1	2	3	4	5	6	7	8	9	10	11	12	Err
0–5Vdc	<0.4	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.5	>4.6
0–3Vdc	<0.2	N.S.	0.3	0.5	0.7	0.9	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.7	>2.8

(N.S. = Not Supported)

CAN-bus output option

If you plan to use the icountPDR with a CAN-bus (SAE J1939) network, you can order this output option when specifying the unit. Refer to the 'Product configurator' (page 45) in the Reference section of this manual. The CAN option provides an interface to external CAN-bus networked systems – for example, to the *Parker IQAN*.

Moisture sensor output settings

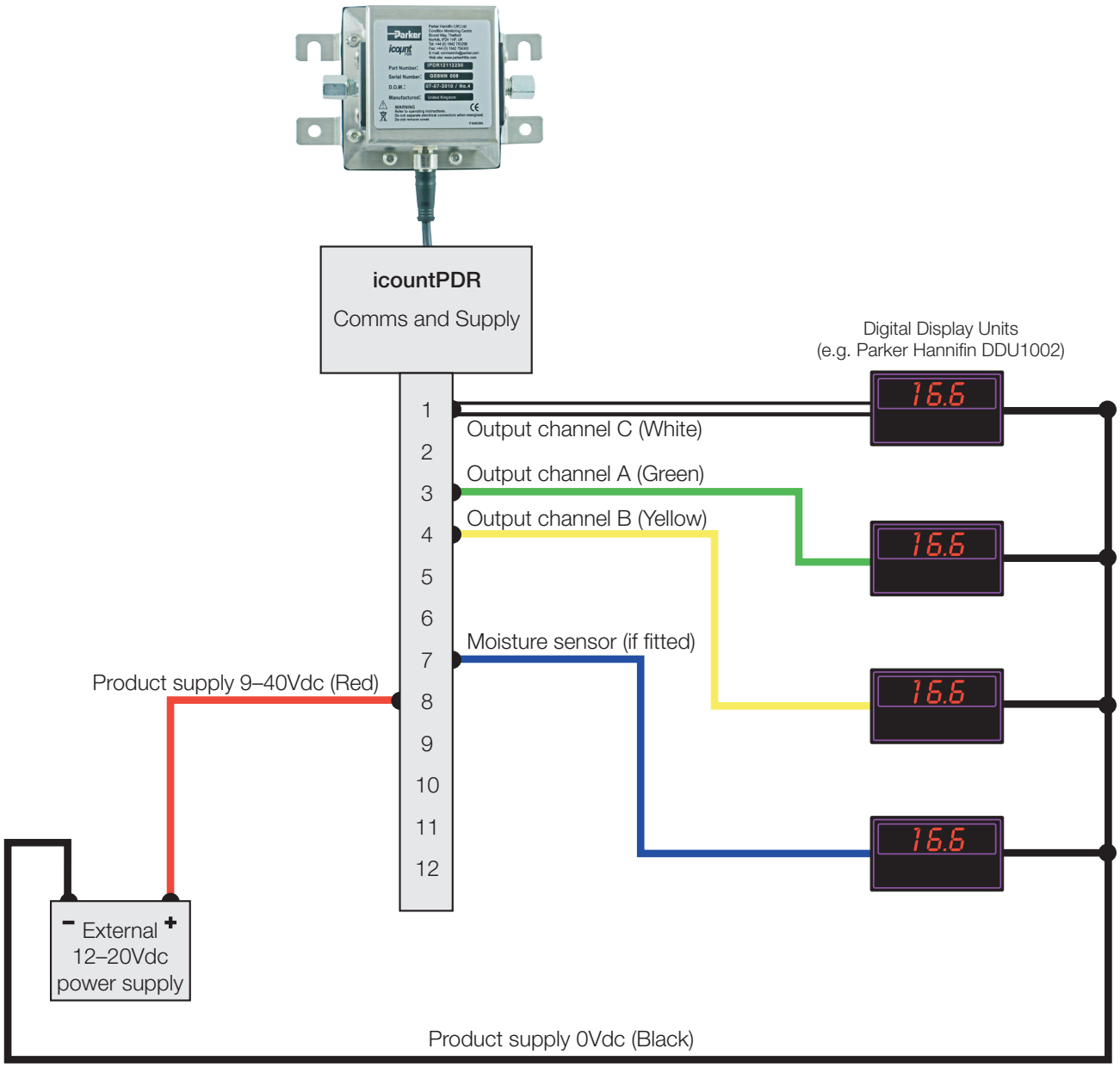
The Moisture sensor is an option that can be included when specifying the icountPDR. Refer to the 'Product configurator' (page 45) in the Reference section of this manual.

The Moisture sensor reports on the saturation levels of the fluid passing through the icountPDR sensing cell. The output is a linear scale, reporting within the range of 5% saturation to 100% saturation.

Table relating Saturation levels in the sensing cell to icountPDR outputs

Saturation	4–20mA	0–3Vdc	0–5Vdc
5%	4.8	0.15	0.25
25%	8	0.75	1.25
50%	12	1.50	2.50
75%	16	2.25	3.75
100%	20	3.00	5.00

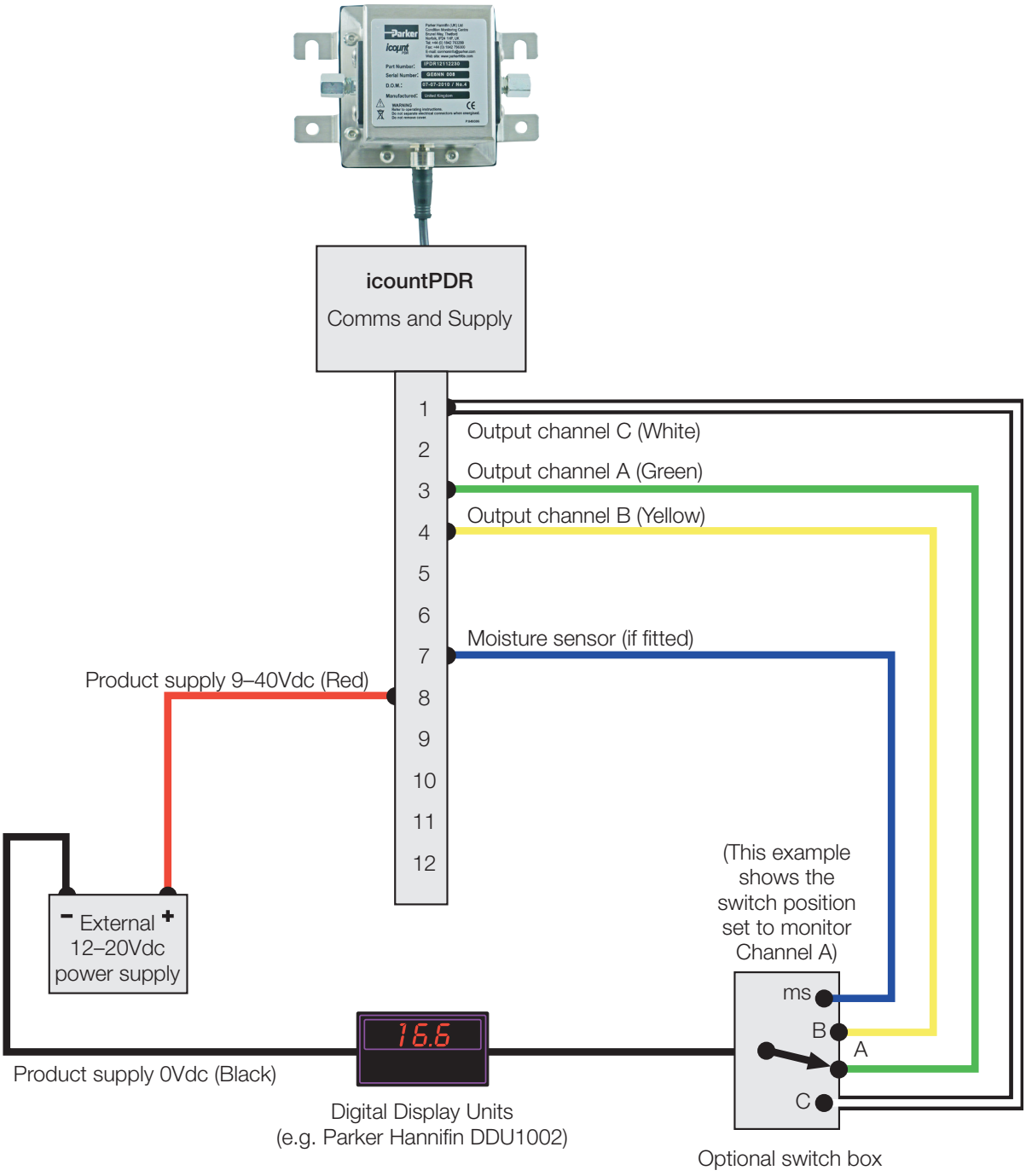
Digital Display Unit connection



The above diagram shows how a set of Parker Hannifin DDUs can be used to display Channels A, B and C, plus the Moisture sensor (if fitted).

DIGITAL DISPLAY UNITS AVAILABLE

Part number	Description
DDU1001	Process indicator, 22–55Vdc
DDU1002	Process indicator, 90–264Vdc



The above diagram shows how a single DDU can be used to display Channels A, B and C, plus the Moisture sensor (if fitted), by using a switch to display each channel in turn.

RS232 connection

Communication can be established between icountPDR and a PC using an RS232 serial connection with the **Parker Utility Setup Tool**, the **Parker Terminal** utility, or via Microsoft Windows® HyperTerminal.

Please note that **HyperTerminal** is not supplied with Windows Vista™, but the **Parker Utility Setup Tool** and **Parker Terminal** can be used with this operating system. Both Parker programs are supplied on the icountPD CD.

PC connection

The RS232 wires need to be connected to a 9-way D-type connector (not supplied as standard). For the connector pin termination and wire colour, refer to the 'Communication and Supply cable connector' section of this manual (page 16).

The device can then be either connected direct to PC serial port (Figure 1) or connected via an RS232-to-USB adaptor cable (Figure 2).

RS232 to USB convertor can be supplied by Parker Hannifin (part number ACC6NN017).

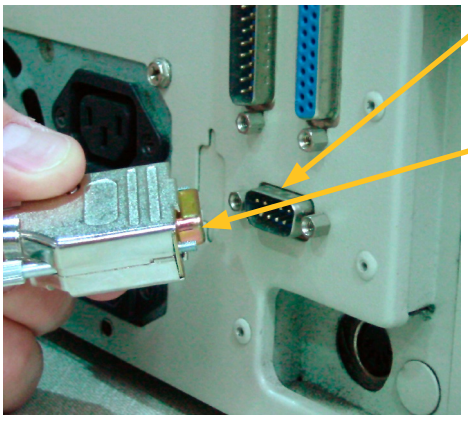


Figure 1

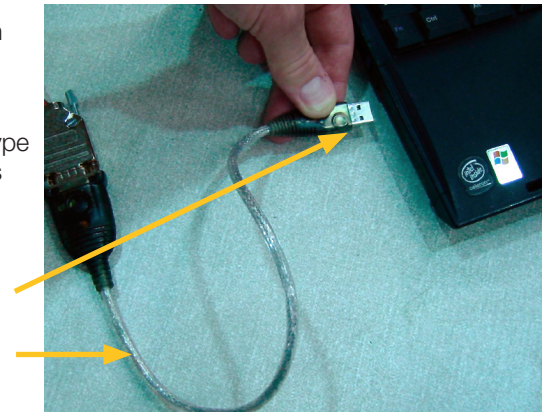


Figure 2

NOTE: The 9-way D-type connector, RS232-to-USB adaptor cable and installation software are not supplied as standard with the icountPDR.

Software

The icountPDR may be configured using the **icountPD Setup Utility**, supplied on CD.

For more direct control of the device using its communications protocol, you may use the **Parker Terminal** program: both Parker programs are supplied on the icountPDR CD. You may also use Microsoft Windows® **HyperTerminal** program, but note that this program is not currently supplied with the Windows Vista™ operating system.

icountPD Setup Utility software

PC Installation

The icountPD Setup Utility and Parker Terminal software is available on the CD supplied with the icountPDR. The software can be run directly from the CD or copied to a PC hard drive.

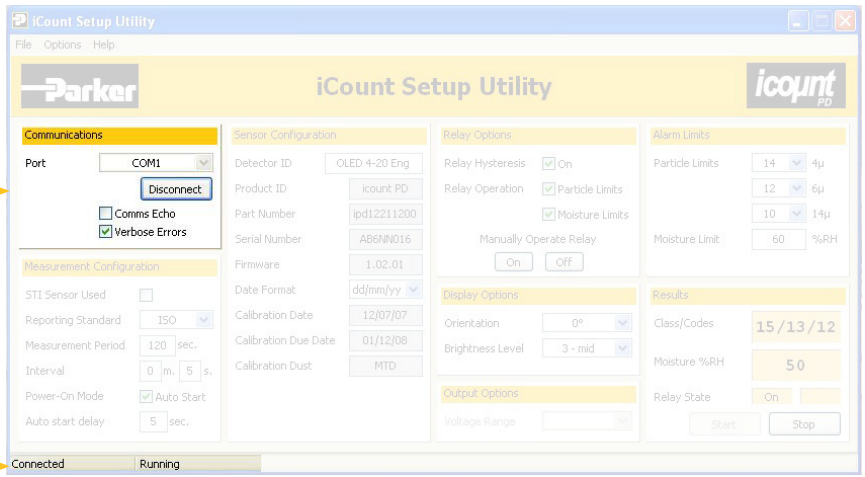
Using the icountPD Setup Utility

Check that the icountPDR is connected to power and the communication cable is connected to the PC via the RS232 plug.

Place the CD in your PC drive and wait for the selection screen to appear. On starting the software, the icountPD Setup Utility screen appears.

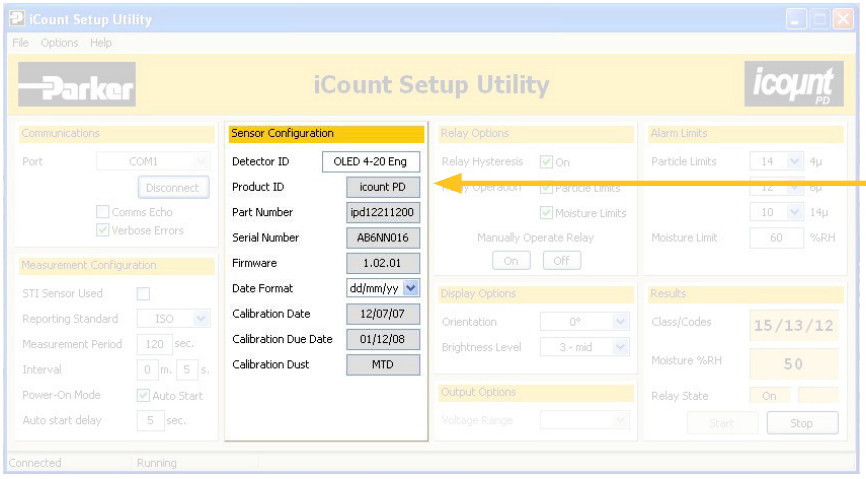
Step 1A:

With the icountPDR connected to power and the RS232 connected to the PC, select the appropriate communication port.



Step 1B:

Note the status of the icountPDR.



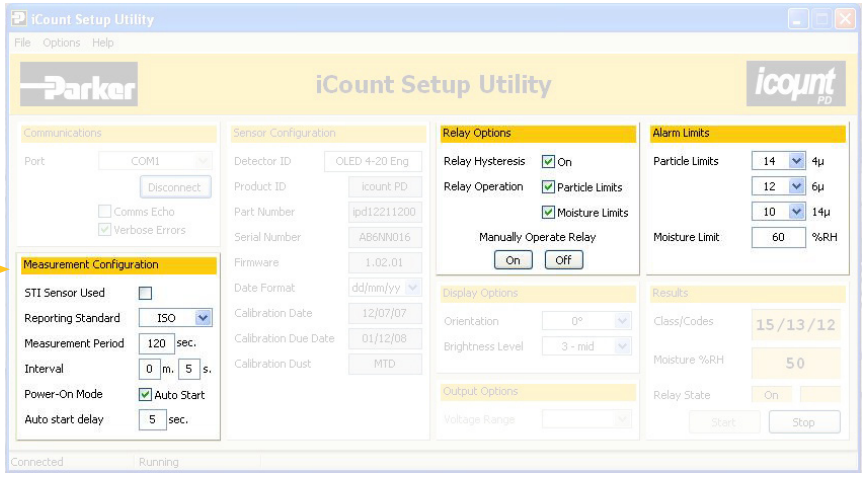
Step 2:

Set the values for ‘Detector ID’ and ‘Date Format’.

The remaining detector information is preset by Parker Hannifin and cannot be changed.

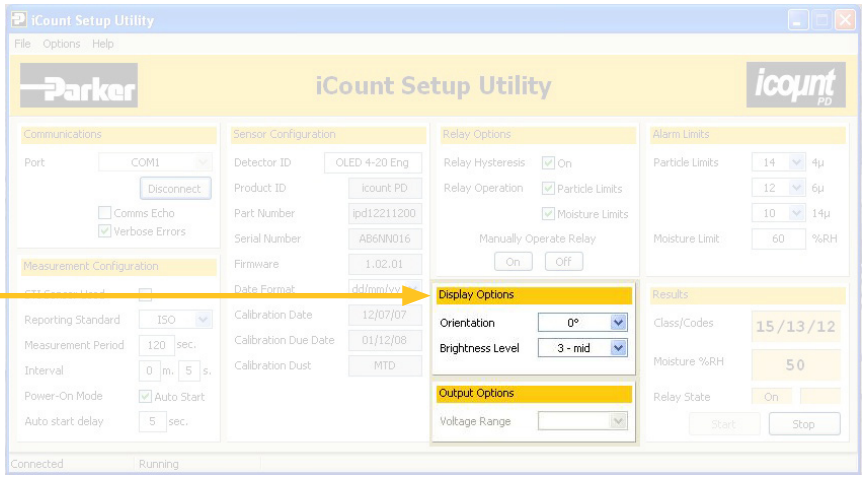
Step 3:

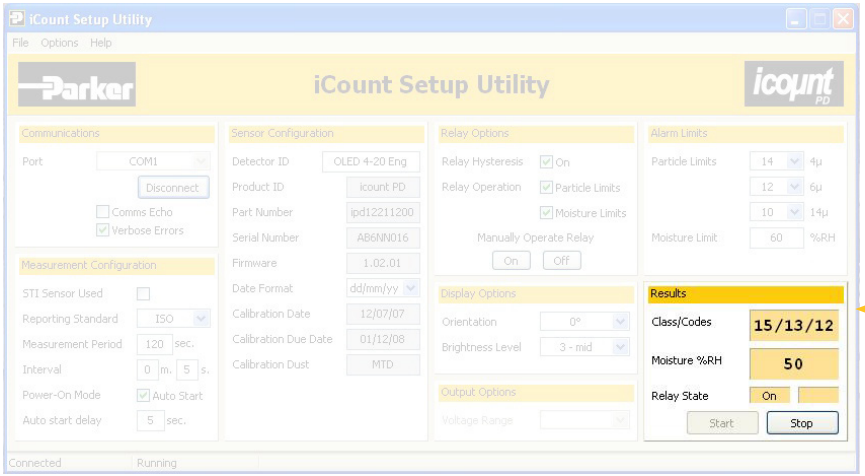
Set the values in ‘Measurement Configuration’, ‘Relay Options’ and ‘Alarm Limits’.



Step 4:

Set the Voltage Range (0–5V, 0–3V or J1939) in ‘Output Options’ according to the options fitted.





Step 5:

Setup values are verified as valid in ‘Results’.

Click ‘Start’ to start verification and ‘Stop’ to stop.

Microsoft Windows® HyperTerminal connection

An alternative way of achieving communication with icountPDR is to use the HyperTerminal program supplied with Microsoft Windows (but not always installed on the PC or laptop's hard disk – check the installation disk, or contact your organisation's IT department if the program is not present). **Please note that HyperTerminal is not supplied with Windows Vista™, but the Parker Terminal utility can be used with this operating system**.

The standard communication settings (used in STEP 4) are as follows:

Baud Rate	9600
Data bits	8
Parity	None
Stop bits	1
Flowcontrol	None

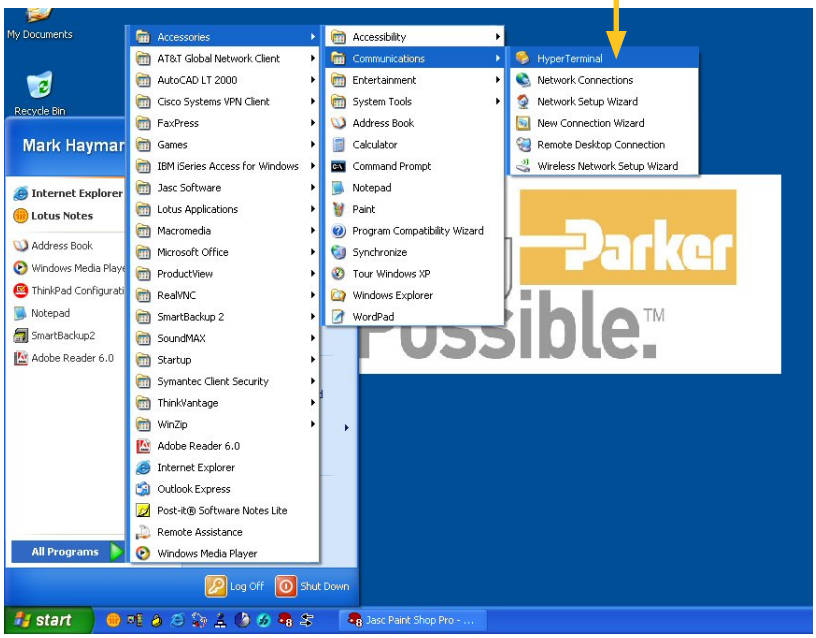
Step 1:

Click 'Start'

Step 2:

Select 'HyperTerminal'.

(from All Programs
- Accessories
- Communications
- HyperTerminal)



Step 3:

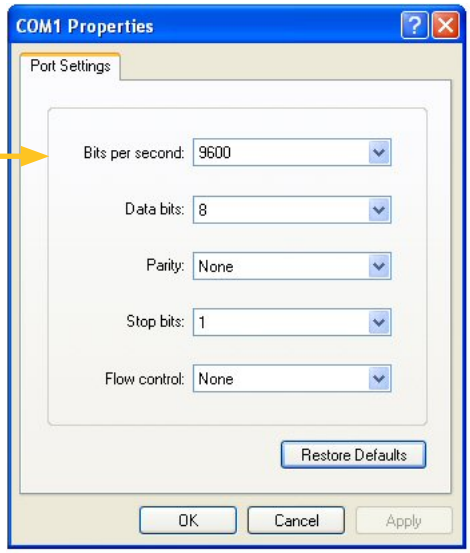
Click and type the connection name you wish to use to identify this session

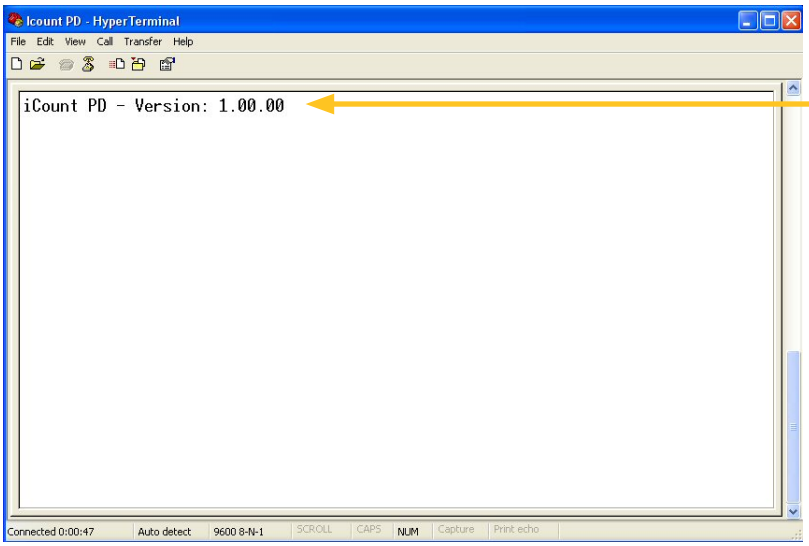
Step 4:

Select the appropriate USB port.

Step 5:

Enter the communication settings (as in the 'standard communications settings' table, on the previous page).





Step 6:

Once the icountPDR is connected to power, the product identification is displayed. (This screen shown is only for example.)

This confirms that communication to icountPDR has been established and the unit is now ready for operation.

Communication protocol

The commands used with the icountPDR are either made up of Set, Read or Start/Stop commands.

- Set commands allow the value or values of parameters to be changed
- Read commands allow the value or values of parameters to be read
- Start/Stop commands allow the user to start and stop tests.

Example:

[SDF dd/mm/yy] sets the date format
[RDF] reads the product format date

All commands are sent in ASCII characters, and the protocol accepts both upper and lower case characters. For example, all of the following codes are equivalent:
SDF = Sdf = SDf = sdF = sdf

NOTE: The use of a '=' after a command, for example [SDF = dd/mm/yy], is optional.

Certain commands are for expert use only and can be accessed via a password system. Should an unauthorized person attempt to access these commands the icountPDR returns the error code for 'Invalid Command'.

A list of error codes is given on page 34.

Most-used commands

Common User Read commands		
Command	**Description**	**icountPDR response**
RDU	Read calibration dust	Calibration dust displayed (i.e. MTD or ACFTD)
RLT	Read NAS or ISO limits	Limits displayed
RRS	Read reporting standard	ISO or NAS displayed

Common User Set commands		
Command	**Description**	**User response**
SLT	Set limits i.e. 'SLT 19 18 15'	SLT ## ## ## (for ISO) SLT ## (for NAS)
SRS	Set reporting standard	SRS iso SRS nas
SRI	Set reporting interval 0 to 3600 seconds 0 = No reporting	SRI ####

NOTE: The reporting interval (SRI) controls how often the icountPDR sends results over the RS232.

User Start/Stop commands		
Command	**Description**	**Response**
STR or START	Start testing	'OK' displayed
STP or STOP	Stop testing	'OK' displayed

Full list of commands

User Read Commands		
Command	**Description**	**icountPDR response**
RCD	**R**ead the last **C**alibration **D**ate	Last calibration date displayed
RCE	**R**ead **C**ommunication Echo	'ON' or 'OFF' displayed
	Comms Echo ON allows the icountPDR to communicate in two directions (Hyperterminal) *Comms Echo OFF allows the icountPDR to communicate in one direction (Setup Utility)*	
RDD	**R**ead the next calibration **D**ue **D**ate	Next calibration due date displayed
RDF	**R**ead **D**ate **F**ormat	Date format displayed (e.g. dd/mm/yy)
RDI	**R**ead **D**etector **I**D	Detector ID displayed
RDS	**R**ead **D**etector **S**tatus	IPD status displayed (e.g. RUNNING)
RDU	**R**ead the calibration **D**ust **U**nit	Calibration dust displayed (i.e. MTD or ACFTD)
REN	**R**ead last **E**rror **N**umber	Last error number displayed
RER	**R**ead last **E**rror text **R**eport	Last error text displayed
REV	**R**ead the **E**rror **V**erbose mode	Error verbose mode displayed
	Error Verbose ON displays the full description of the error code (i.e. Error 40 – expected On or Off) *Error Verbose OFF displays just the error code (i.e. Error 40)*	
RFN	**R**ead **F**ault **N**umber	Fault number displayed
RJE	**R**ead **J**1939 Status	'ON' or 'OFF' displayed
RLR	**R**ead the **L**ast contamination **R**esult	Last contamination result displayed
RLT	**R**ead contamination **L**imit **T**hreshold	Contamination limits displayed
RML	**R**ead **M**oisture sensor **L**imit [1]	Moisture limit displayed
RMP	**R**ead **M**easurement **P**eriod	Measurement period displayed
RMV	**R**ead the last **M**oisture sensor **V**alue [1]	Last moisture result displayed
ROF	**R**ead **O**ptions **F**itted	ROF = ABCDEFGHIJ (see list of options below)
RON	**R**ead **O**ption **N**ame	List of options A = Alarm relay option B = LED display option C = OLED display option D = Moisture sensor option E = 4–20mA current loop option F = 0–3/0–5V option G = J1939 option H = reserved I = reserved J = reserved
RPD	**R**ead the **P**ower on hold-off **D**elay	Power hold-off delay displayed
RPI	**R**ead **P**roduct **I**dentifier	icountPDR displayed
RPM	**R**ead the **P**ower on **M**ode	'AUTO' or 'MANUAL' displayed
RPN	**R**ead the icountPDR **P**art **N**umber	Parker part number displayed
RPT	**R**ead **P**roduct **T**ype	IPDH
RPV	**R**ead **P**rotocol **V**ersion	Protocol version displayed
RRI	**R**ead **R**eporting **I**nterval	Reporting interval displayed
RRS	**R**ead **R**eporting **S**tandard	'ISO' or 'NAS' displayed
RSB	**R**ead Software Build number	Software build number displayed
RSH	**R**ead limit relay **S**witch **H**ysteresis [2]	'ON' or 'OFF' displayed
RSL	**R**ead **S**tandards **L**ist	ISO, NAS

RSN	**R**ead **S**erial **N**umber	Serial number displayed
RSS	**R**ead limit relay **S**witch **S**tate [2]	'ON' or 'OFF' displayed
RSU	**R**ead STI **S**ensor **U**sed	'YES' or 'NO' displayed
RSV	**R**ead **S**oftware **V**ersion displayed	Software version displayed
RVM	**R**ead the **V**oltage **M**aximum range [3]	Voltage range displayed
RWC	**R**ead **W**arning limit relay for **C**ontamination [2]	'ON' or 'OFF' displayed
RWM	**R**ead **W**arning limit relay for **M**oisture [1,2]	'ON' or 'OFF' displayed

[1] Command requires a Moisture Sensor to be fitted to icountPDR
[2] Command requires a Limit Relay to be fitted to icountPDR
[3] Command requires a 0–5V option to be fitted to icountPDR

User Set Commands

Command	Description	icountPDR response
SCE	**S**et **C**ommunication **E**cho	SCE on SCE off
	Comms Echo ON allows icountPDR to communicate in two directions (Hyperterminal) *Comms Echo OFF allows icountPDR to communicate in one direction (Setup Utility)*	
SDF	**S**et **D**ate **F**ormat	SDF dd/mm/yy SDF mm/dd/yy SDF yy/mm/dd
SDI	**S**et **D**etector **I**D	SDI ############## (14 characters maximum, spaces not allowed)
SEV	**S**et the **E**rror **V**erbose mode	SEV on SEV off
	Error Verbose ON displays the full description of the error code (i.e. Error 40 – Expected On or Off) *Error Verbose OFF displays just the error code (i.e. Error 40)*	
SJE	**S**et **J**1939 Status	SJE On/Off (can only set On)
SLT	**S**et contamination **L**imit **T**hreshold	SLT ## ## ## (for ISO) SLT ## (for NAS)
SML	**S**et **M**oisture sensor **L**imit [1]	SML ###
SMP	**S**et **M**easurement **P**eriod	SMP ### (### = 5 to 180 seconds)
	The Measurement period sets the number of seconds the detector uses to determine the contamination levels. So if this is 60 seconds, the unit will use the last 60 seconds of oil to determine the contamination level. (See the 'Component cleanliness guideline' chart in the Reference section of this manual.)	
SPD	**S**et the **P**ower on hold-off **D**elay	SPD ### (### = 0 to 900 seconds)
	The Power-on hold-off delay command allows the user to delay the start of the icountPDR operation.	
SPM	**S**et the **P**ower on **M**ode	SPM auto SPM manual
	With the Power-on Mode set to 'Auto' icountPDR starts testing automatically when the power is connected using the last setup parameters. With the Power-on Mode set to 'Manual' icountPDR becomes idle and requires the user to manually start testing.	
SRI	**S**et **R**eporting **I**nterval	SRI mm:ss (0 to 3600 seconds (i.e. 0–1 hour); note that 0 = No reporting)
	The Reporting Interval controls how often icountPDR sends results over the RS232	
SRS	**S**et **R**eporting **S**tandard	SRS iso SRS nas

SSH	**S**et limit relay **S**witch **H**ysteresis [2]	SSH on SSH off
SSS	**S**et limit relay **S**witch **S**tate [2]	SSS on SSS off
SSU	**S**et STI **S**ensor **U**sed	SSU yes SSU no
SVM	**S**et the **V**oltage **M**aximum range [3]	SVM # (3 = 0–3Vdc output 5 = 0–5Vdc output)
SWC	**S**et **W**arning limit relay for **C**ontamination [2]	SWC on SWC off
SWM	**S**et **W**arning limit relay for **M**oisture [1, 2]	SWM on SWM off

[1] Command requires a Moisture sensor to be fitted to the icountPDR

[2] Command requires a Limit Relay to be fitted to the icountPDR

[3] Command requires a 0–5Vdc option to be fitted to the icountPDR

Error codes

If a command does not follow the protocol, an explanatory error code is returned.

Depending on the setting of *SEV* (**S**et the **E**rror **V**erbose mode), either the error code, or the error code and message are displayed.

For example, with SEV OFF (Error Verbose off) just the error code (e.g. Error 40) is returned. With SEV ON (i.e. Error Verbose on) both the error code and message (e.g. Error 40 - Expected On or Off) are returned.

Messages corresponding to the error codes are given in the following table:

Code	Message
Error 0	No error
Error 1	Unknown command
Error 2	Characters after command ignored
Error 3	Command ignored – unit is busy
Error 5	Unexpected character found
Error 6	Symbol too long
Error 7	Bad command format
Error 8	Unknown value
Error 9	Invalid date format
Error 10	Invalid date
Error 13	Option not fitted
Error 14	String too short
Error 15	String too long
Error 17	No test result
Error 18	Number expected
Error 19	Number too long
Error 20	Number out of range
Error 30	Interval shorter than duration
Error 40	Expected On or Off
Error 41	Expected Disabled or Enabled
Error 43	Expected Auto or Manual
Error 45	Expected Yes or No

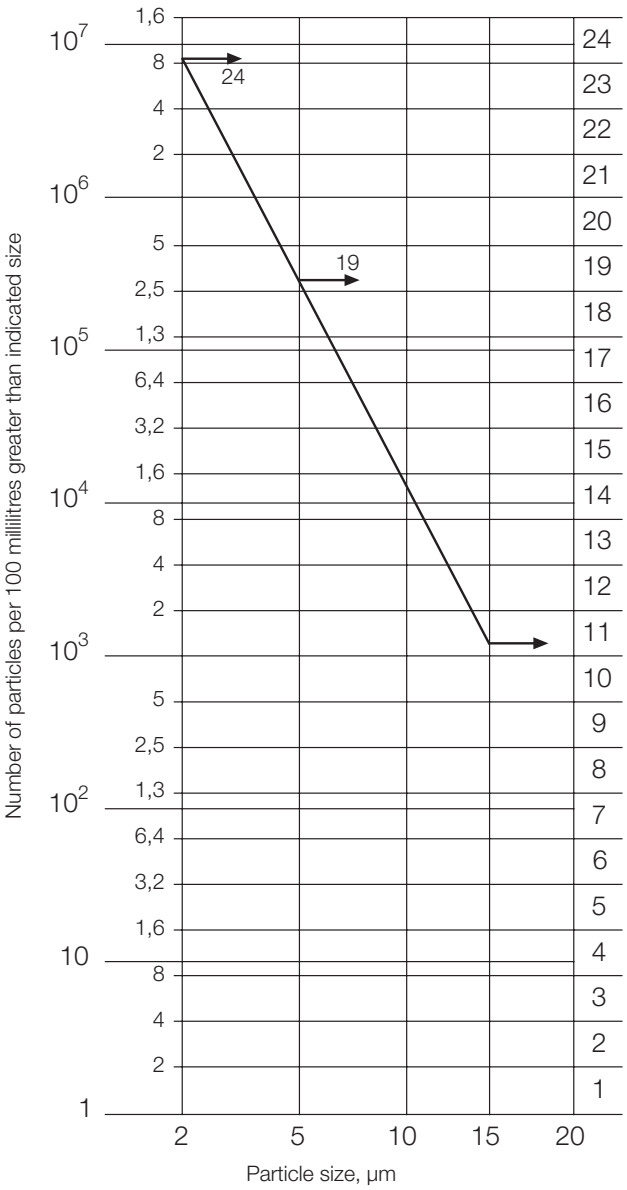
Reference

Interpreting data

Solid contaminants in fluid power systems vary in size, shape, form and quantity. The most harmful contaminants are normally between 6 microns and 14 microns. The ISO code is the preferred method of reporting quantity of contaminants.

The ISO code number corresponds to contamination levels relating to three sizes.

The first scale number represents the number of particles larger than 4µm(c) per 100 millilitre of fluid, the second number for particles larger than 6µm(c) per 100 milllilitre of fluid and the third number for particles larger than 14µm(c) per 100 millilitre of fluid.



Note that interpolation (i.e. estimation within the measured range) is acceptable; extrapolation (i.e. estimation outside of the measured range) is not.

ISO contamination numbers

Range number	Number of particles per 100ml	
	More than	Up to and including
24	8×10^6	16×10^6
23	4×10^6	8×10^6
22	2×10^6	4×10^6
21	1×10^6	2×10^6
20	500×10^3	1×10^6
19	250×10^3	500×10^3
18	130×10^3	250×10^3
17	64×10^3	130×10^3
16	32×10^3	64×10^3
15	16×10^3	32×10^3
14	8×10^3	16×10^3
13	4×10^3	8×10^3
12	2×10^3	4×10^3
11	1×10^3	2×10^3
10	500	1×10^3
9	250	500
8	130	250
7	64	130
6	32	64
5	16	32
4	8	16
3	4	8
2	2	4
1	1	2

For example: code 20/18/13 indicates that there are between 500,000 and 1,000,000 particles larger than 2 microns, and between 130,000 and 250,000 particles larger than 5 microns, and between 4000 and 8000 particles larger than 15 microns.

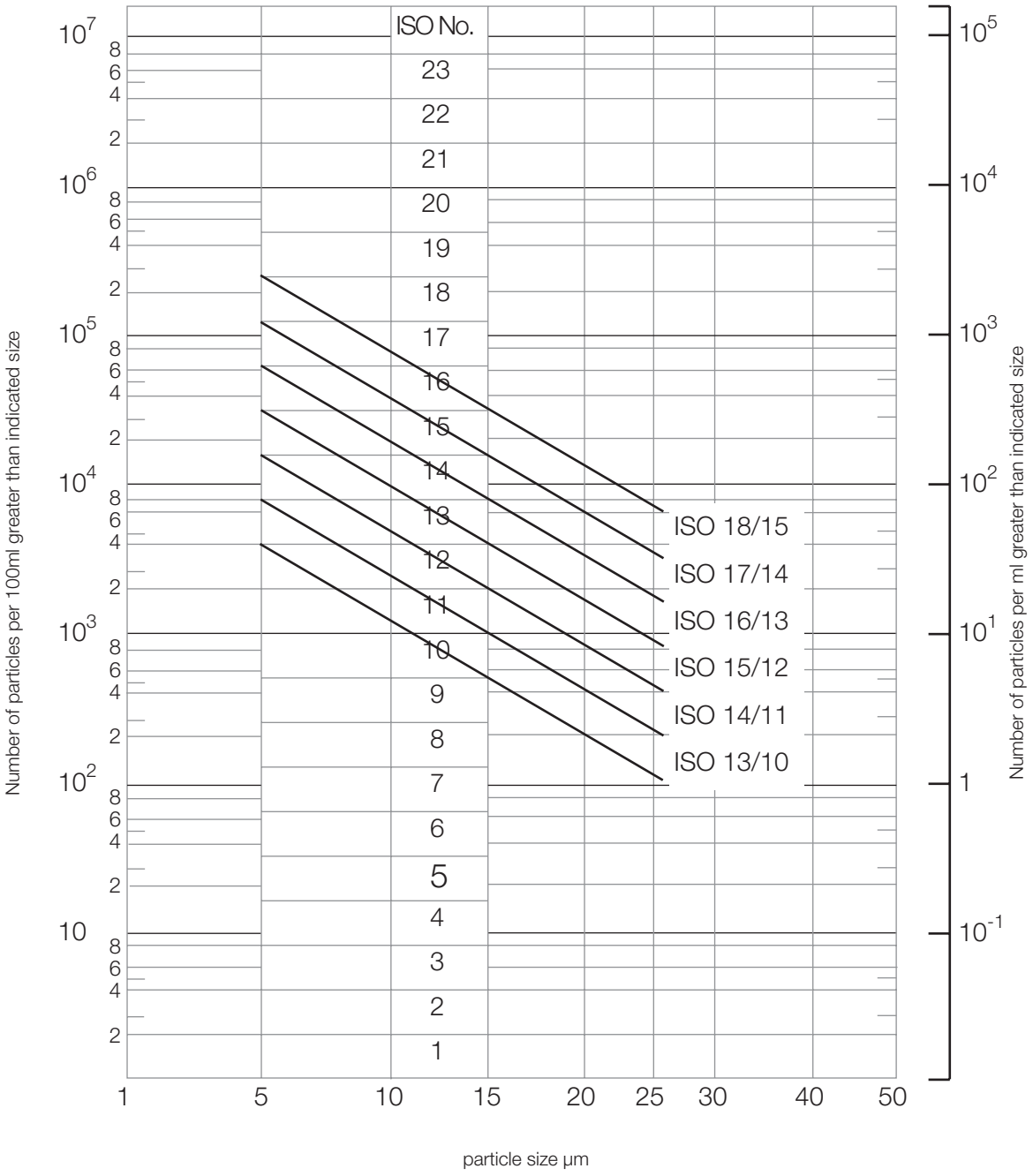
REFERENCE ISO 4406:1999

When the raw data in one of the size ranges results in a particle count of fewer than 20 particles, the scale number for that size range is labelled with the symbol '>'.

For example, a code of **14/12/>7** signifies that there are more than 8,000 and up to and including 16,000 particles equal to or larger then 4µm (c) per 100 ml and more than 2,000 and up to and including 4,000 particles equal to or larger than 6µm (c) per 100 ml. The third part of the code, >7 indicates that there are more than 64 and up to and including 130 particles equal to or larger than 14µm (c) per 100 ml. But the 14µm (c) part of the code could actually be 7, indicating a particle count more than 130 particles per 100 ml.

ISO4406 particle distribution chart

The chart includes various ISO level contamination grades



NAS 1638 chart

	Size range µm	5–15	15–25	25–50	50–100	>100
Classes (based on maximum contamination limits, particles per 100ml)	00	125	22	4	1	0
	0	250	44	8	2	0
	1	500	89	16	3	1
	2	1000	178	32	6	1
	3	2000	356	63	11	2
	4	4000	712	126	22	4
	5	8000	1425	253	45	8
	6	16,000	2850	506	90	16
	7	32,000	5700	1012	180	32
	8	64,000	11,400	2025	360	64
	9	128,000	22,800	4050	720	128
	10	256,000	45,600	8100	1440	256
	11	512,000	91,000	16,200	2880	512
	12	1,024,000	182,400	32,400	5760	1024

ISO/NAS/SAE comparison chart

BS 5540/4	Defence Std. 05/42		NAS 1638	SAE 749
	Table A	Table B		
11/8			2	
12/9			3	0
13/10			4	1
14/9		400F		
14/11			5	2
15/9	400			
15/10		800F		
15/12			6	3
16/10	800			
16/11		1300F		
16/13			7	4
17/11	1300	2000		
17/14			8	5
18/12	2000			
18/13		4400F		
18/15			9	6
19/13	4400	6300F		
19/16			10	
20/13	6300			
20/17			11	
21/14	15,000			
21/18			12	
22/15	21,000			
23/17	100,000			

The above comparisons relate to particle count data only. To confirm to any particular standard, reference should be made to the recommended experimental procedure.

Component cleanliness guidelines

Suggested acceptable contamination levels for various hydraulic systems.

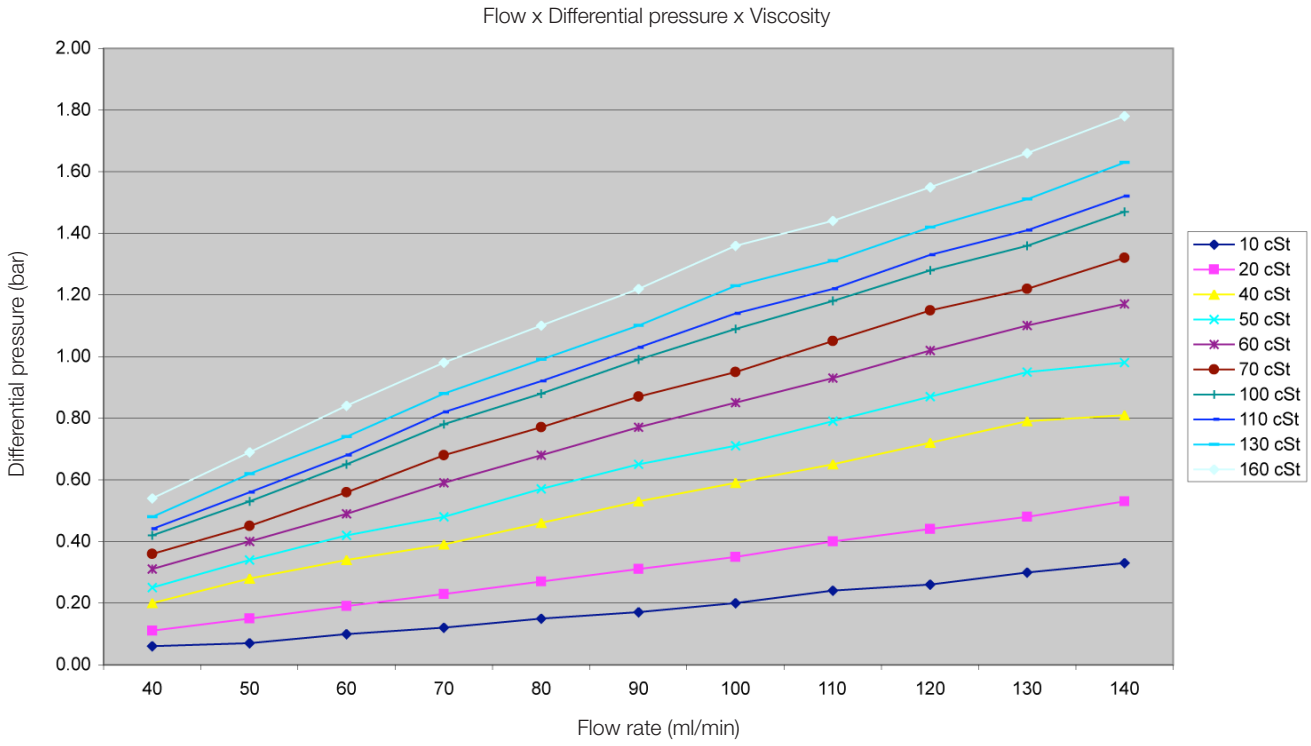
Target contamination class to ISO 4406		Suggested maximum particle level		Sensitivity	Type of system	Typical components
6µm	14µm	6µm	14µm			
13	9	4000	250	Super critical	Silt-sensitive control system with very high reliability. Laboratory or aerospace.	High performance servovalves
15	11	16,000	1,000	Critical	High performance servo and high pressure long life systems, e.g. aircraft, machine tools etc.	Industrial servovalves
16	13	32,000	4,000	Very important	High quality reliable systems. General machine requirements.	Piston pumps, proportional valves, compensated flow controls
18	14	130,000	8,000	Important	General machinery and mobile systems. Medium pressure, medium capacity.	Vane pumps, spool valves
19	15	250,000	16,000	Average	Low pressure heavy industrial systems, or applications where long life is not critical.	Gear pumps, manual and poppet valves, cylinders
21	17	1,000,000	64,000	Main protection	Low pressure systems with large clearances.	Ram pumps

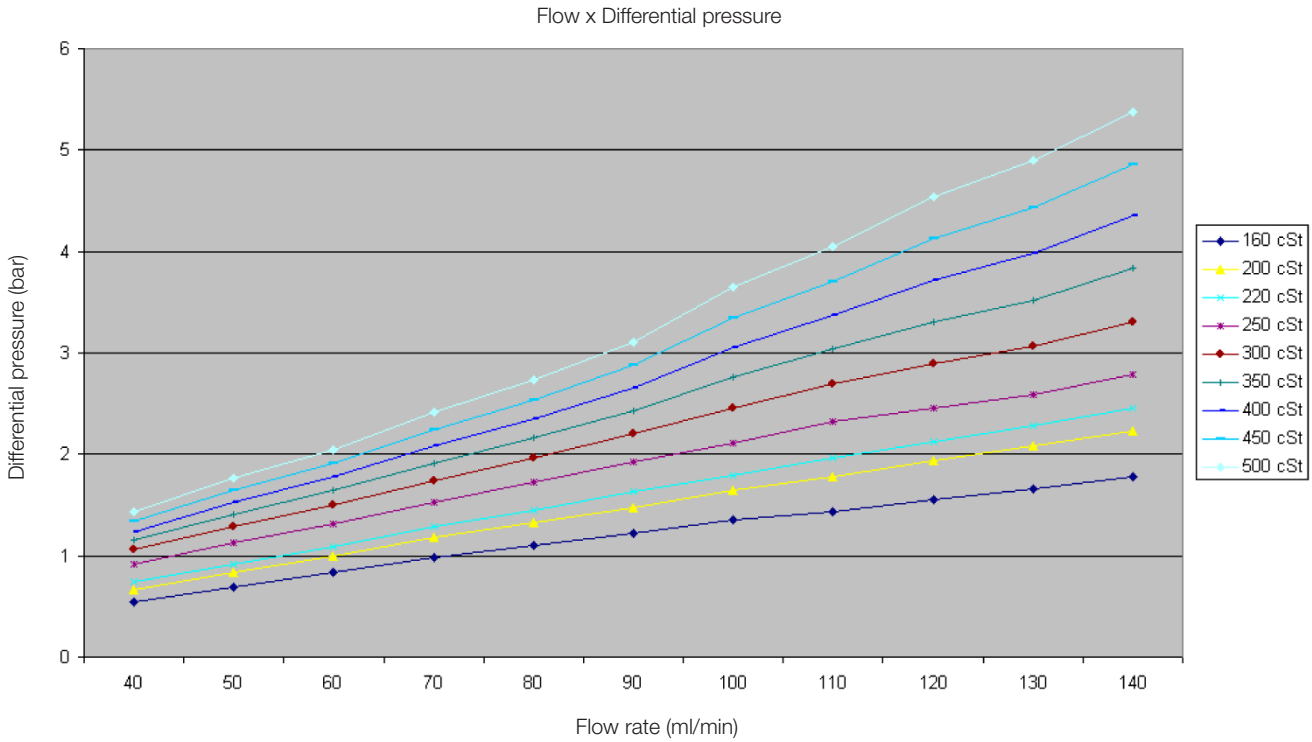
Viscosity charts

The following charts indicate the differential pressure required to run a successful test at the appropriate flow rates.

Example: If the fluid you wish to analyse has a relative viscosity to 60 cSt, to generate the optimum flow rate 60ml/min a differential pressure of 0.5bar is required.

If the fluid you wish to analyse has a relative viscosity of 400 cSt, a 4 bar differential pressure would result in 130 ml/min.





ISO contamination charts

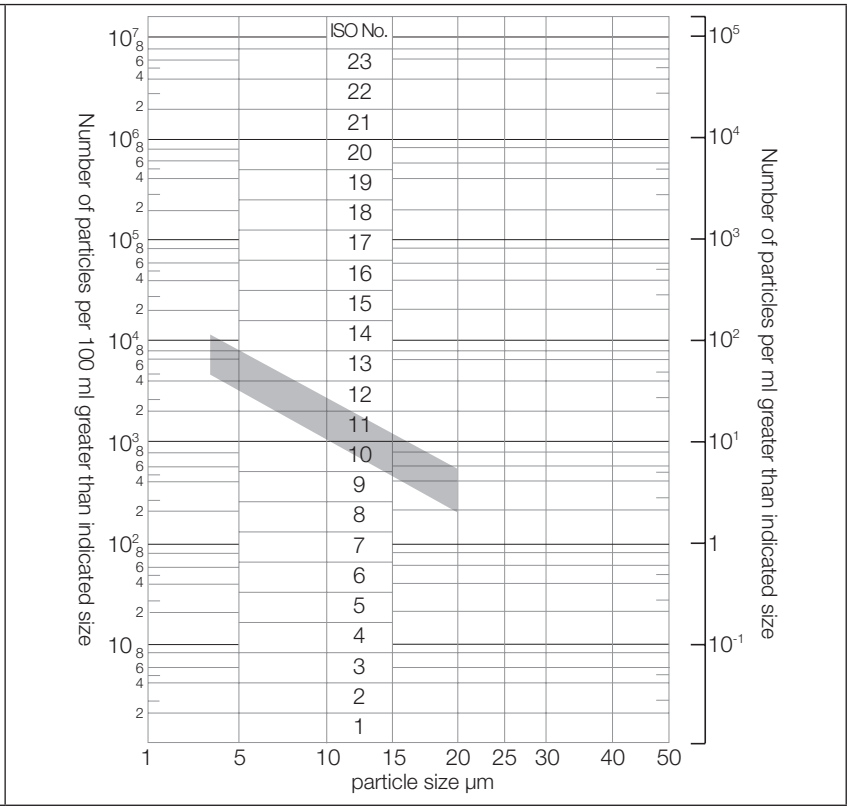
Typical system applications and code numbers

These typical applications and ISO code numbers are taken from the UK Contamination and Control Research Programme (1980–1984).

Ref. AHEM Guide to Contamination Control in Hydraulic Power Systems – 1985

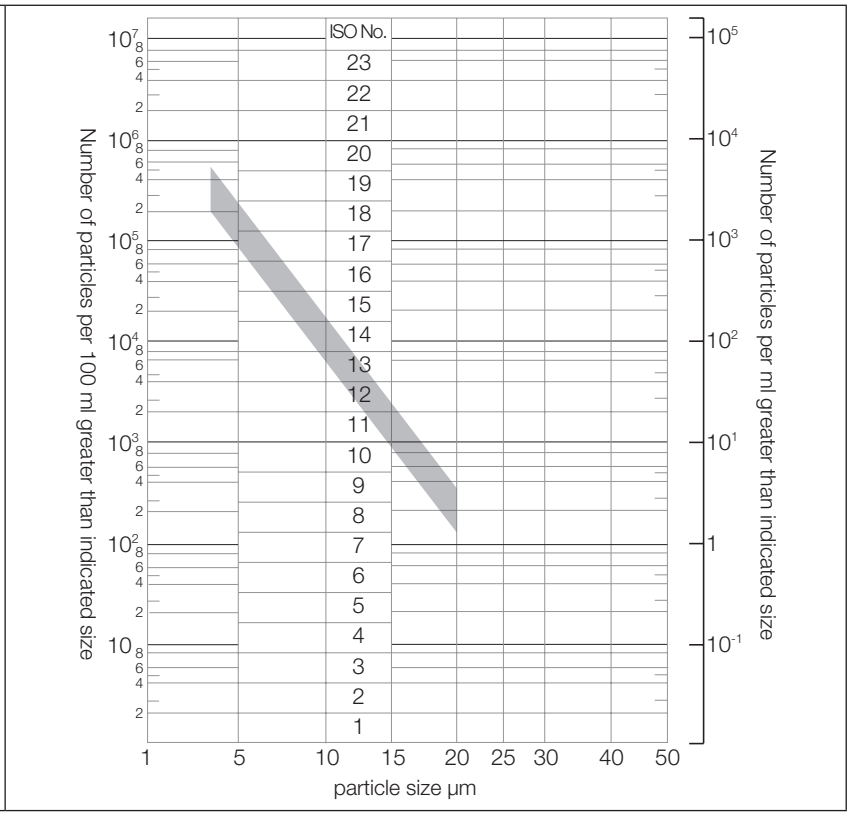
SOLID CONTAMINANT CODE NO 13/10

Application: Aircraft test stands



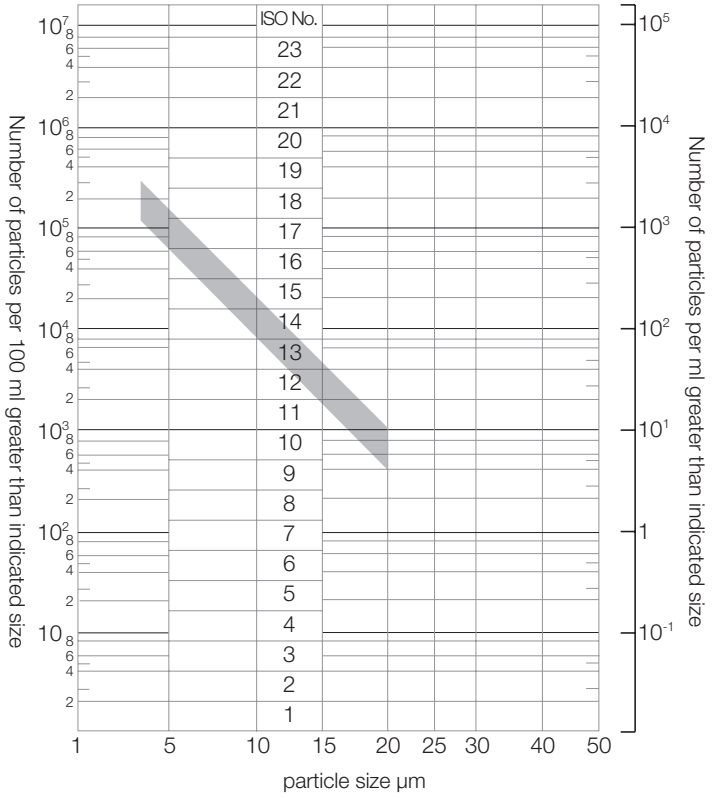
SOLID CONTAMINANT CODE NO 18/11

Application: Mobile systems



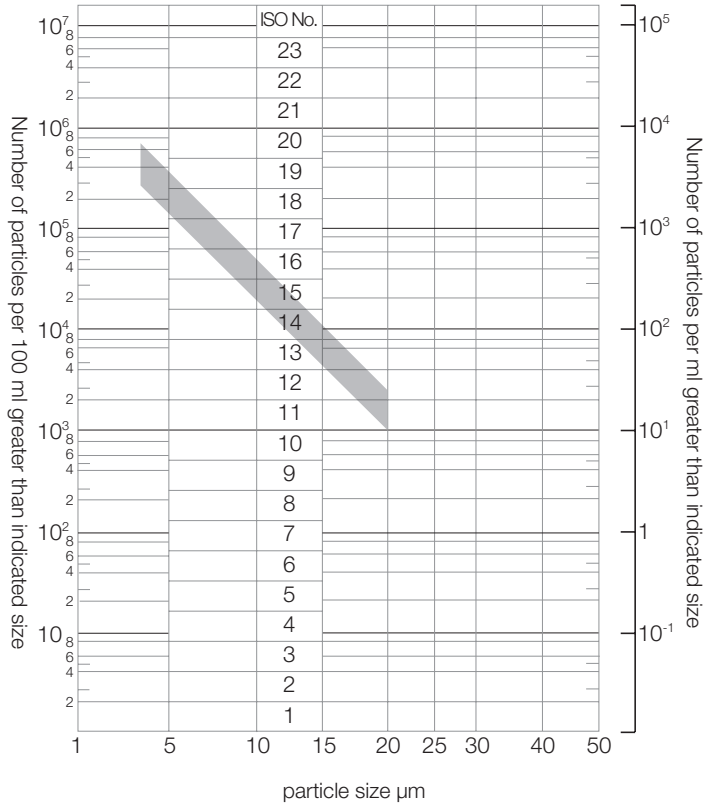
SOLID CONTAMINANT CODE NO 17/12

Application: Marine installations



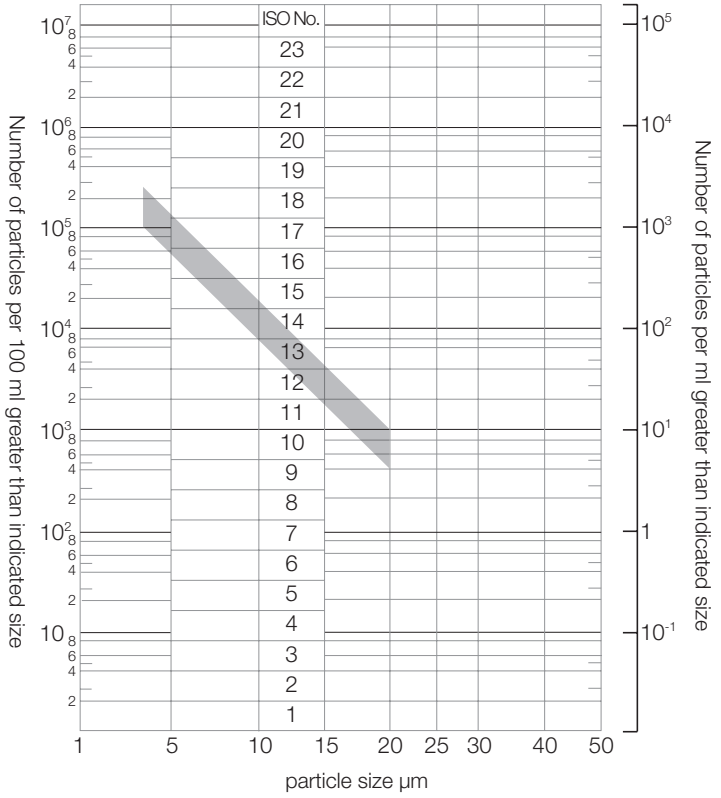
SOLID CONTAMINANT CODE NO 18/13

Applications: Mechanical handling



SOLID CONTAMINANT CODE NO 16/11

Applications: Injection moulding;
Metalworking;
Unused commercial-grade oil



Ordering Information

STANDARD PRODUCTS TABLE

Part Number	Fluid type	Calibration	Display	Limit Relay	Communications	Moisture sensor	Cable connector kit
IPDR12112140	Mineral	MTD	None	No	RS232 / 4–20mA	No	M12, 12-pin plug connector
IPDR12112240	Mineral	MTD	None	No	RS232 / 4–20mA	Yes	M12, 12-pin plug connector
IPDR12113140	Mineral	MTD	None	No	RS232 / 0-5V	No	M12, 12-pin plug connector
IPDR12113240	Mineral	MTD	None	No	RS232 / 0-5V	Yes	M12, 12-pin plug connector

PRODUCT CONFIGURATOR

Key	Fluid type		Calibration		Display		Limit Relay		Comms		Moisture sensor		Cable connector kit	
IPDR	1	Mineral	2	MTD	1	None	1	No	2	RS232 / 4–20mA	1	No	40	M12, 12-pin plug connector
	3	Aviation fuel (4 channels)							3	RS232 / 0–5V	2	Yes	10	Deutsch 12-pin DT series connector
									5	RS232 / CAN-bus				

IPDR OPTIONS NOT CONFIGURABLE

Key	Fluid type		Calibration		Display		Limit Relay		Comms		Moisture sensor	Cable connector kit	
IPDR	2	Phosphate Ester	1	ACFTD	2	LED	2	Relay	4	RS232 / RS485		00	No
			3	AS4059	3	Digital						30	M12, 8-pin plug connector
			4	GOST	4	GSM							

ACCESSORY PART NUMBERS

Description	Part number
Single point sampler	SPS2021
External flow device	S840074
Power supply	ACC6NN013
RS232 to USB converter	ACC6NN017
Flow control device	ACC6NN022

SENSOR PART NUMBERS

Product number	Supersedes	Size	Flow range (l/min)	Fluid type	Port thread (inches)
STI0144100	STI.0144.100	0	6–25	Mineral fluid	⅜
STI1144100	STI.1144.100	1	20–100	Mineral fluid	¾
STI2144100	STI.2144.100	2	80–380	Mineral fluid	1¼

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